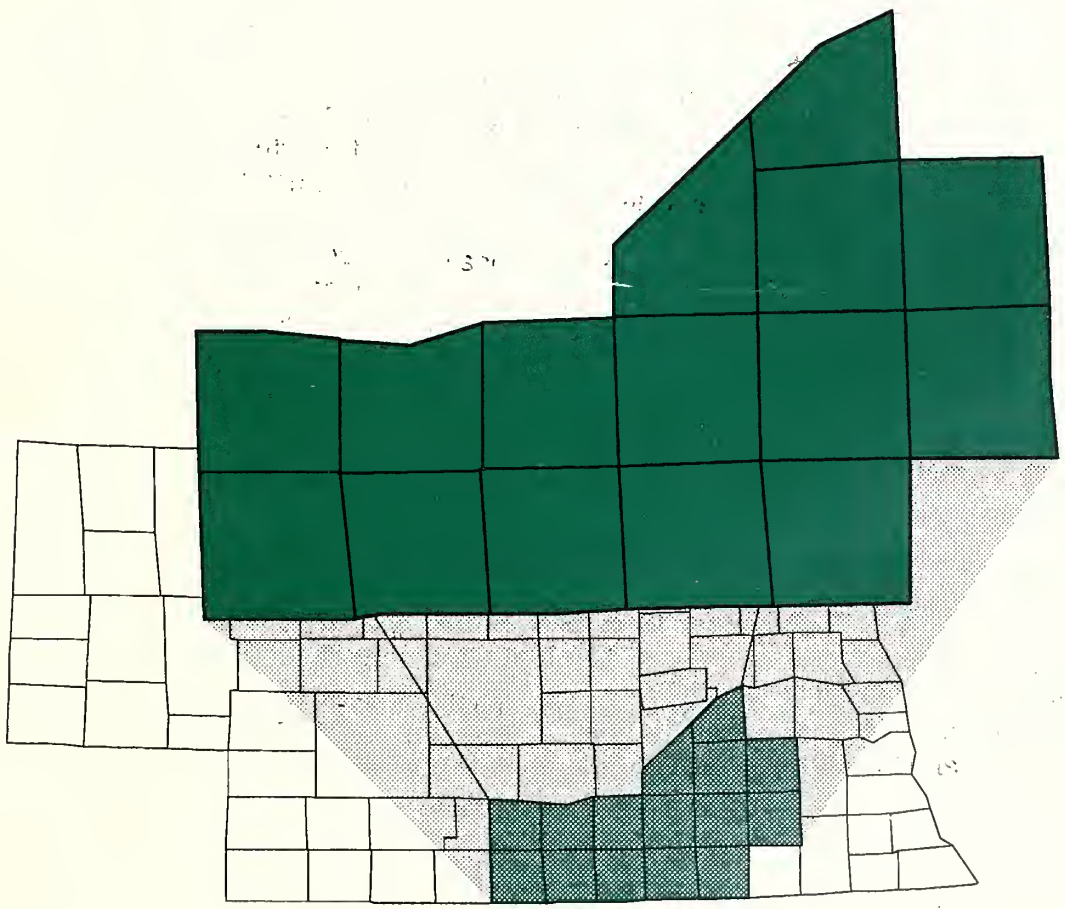
WATER QUALITY

Mid-Nebraska Demonstration Project

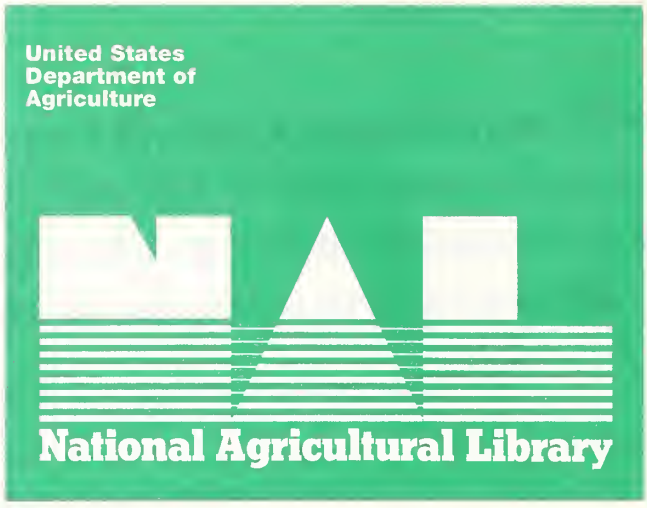
1993

Field Demonstrations of Best Management Practices to Protect Groundwater Quality



SCREC94/2

Soil Conservation Service
University of Nebraska Cooperative Extension



Under the leade **and the**
Universi
the following ag **sonnel**
assis

- A
- I
- C
- I
- Lower Republican Natural Resources District
- Blue River Association of Groundwater Conservation Districts
- UNL Conservation and Survey Division
- USDA Agricultural Research Service
- Nebraska Department of Environmental Quality

PROJECT PERSONNEL

Project Coordinators
Andrew Christiansen, Cooperative Extension
Jerry Willhoft, Soil Conservation Service

Project Technologists
Ed Barnes, Cooperative Extension
Mick Reynolds, Cooperative Extension

Project Secretary
Deena Skalka, Cooperative Extension

Project Communications Specialist
Krista De Groot, Cooperative Extension

Project Leaders
Richard Ferguson, Cooperative Extension
Ken Noonan, Soil Conservation Service

Project Office
South Central Research and Extension Center
P.O. Box 66
Clay Center, NE 68933
(402) 762-3535
(402) 762-4422 - fax

Table of Contents

Project Committee Members

Cooperative Extension
Richard Ferguson, Chair

Agricultural Stabilization and Conservation Service
Darlene Wyrick

UN-L Conservation and Survey Division
David Gosselin

Nebraska Department of Environmental Control
Jeff Gottula

Blue River Association of Groundwater Conservation Districts
Mark Nannen

Advisory Committee Chair
Terry Kubicek
Natural Resources Commission

Soil Conservation Service
Ken Noonan

Agricultural Research Service
Jim Schepers

Tri-Basin NRD
Richard Anderbery

Lower Republican NRD
Ron Wunibald

Little Blue NRD
Mike Onnen

Upper Big Blue NRD
Rodney DeBuhr

Technical Committee Chair
Roger Selley
Cooperative Extension

Producer Representative
Steve Yost

Advisory Committee Organizations

Nebraska Groundwater Foundation
Environmental Protection Agency
Nebraska Rural Water Association
Nebraska Department of Agriculture
Broadcast Media Association

State Department of Health
League of Municipalities
Center for Rural Affairs
Natural Resources Commission
Nebraska Press Association

Nebraska Corn Growers Association
Nebraska Sustainable Agricultural Society
Nebraska Association of Resources Districts
Nebraska Fertilizer & Ag-Chemical Institute
Nebraska Independent Crop Consultants Association
Nebraska Bankers Association

Mid-Nebraska Water Quality Demonstration Project

The Mid-Nebraska Water Quality Demonstration Project (MNWQDP) began in March, 1990 with the authorization of USDA funds from President Bush's Water Quality Initiative. One of eight projects selected nationwide in 1990, the project has four objectives:

1. Foster the adoption of management practices that will reduce nutrient and pesticide loading in the soil.

2. Promote producer adoption of irrigation management practices that provide adequate moisture to grow crops while reducing leaching of agri-chemicals to groundwater.

3. Demonstrate that producers can achieve suitable economic returns while utilizing management practices that reduce inputs and chemical leaching to groundwater.

4. Effectively address critical water quality issues in Nebraska by integrating the re sources and expertise of appropriate federal, state and local agencies and organizations.

Project Description

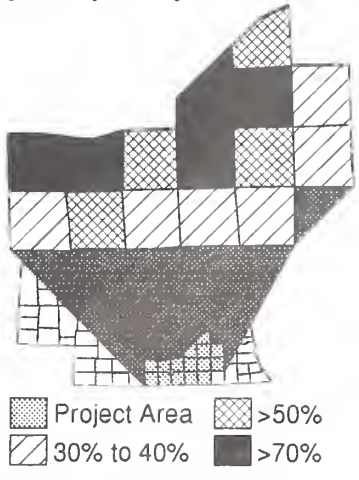
The upland areas of central Nebraska, south of the Platte river, are characterized by medium- to fine-textured loess soils that overlie groundwater that is 50- to 150-feet deep.

Groundwater is abundant in this south-central Plains region. Sand and gravel of Pliocene and Pleistocene age and the Ogallala Group of Miocene age in the west have yielded large quantities of quality groundwater. Nitrate-nitrogen movement under fine-textured soils such as this has not been perceived as an imminent threat to groundwater quality because of the relatively slow movement of water and nitrate in these soils and because of the depth to the aquifer.

There are 3.4 million acres of cultivated land in the 15-county area encompassed by the Mid-Nebraska Water Quality Demonstration Project (see map below). This area has been irrigated for more than 60 years and continuous corn production is the most common agricultural practice on the majority of the irrigated acres. The investments made in irrigation capabilities and the USDA farm program provisions strongly influence cropping decisions in this area.

The 15-county project area encompasses some of the most productive corn-producing acres in Nebraska. While the area accounts for less than 22 percent of the cultivated acres in the state, it produces 35 percent of the corn and accounts for over 30 percent of the nitrogen fertilizer used.

Figure 1. MNWQDP project area, showing percent of irrigated cropland by county.



1989 NE Agricultural Statistics, NE Department of Ag.

Water Quality Problems

There is no critical widespread nitrate problem in the groundwater underlying the 15-county project area at this time, but the intensive, irrigated agricultural practices in south-central Nebraska create the potential for water quality problems. There is evidence from local, state and federal agencies' studies that groundwater nitrate levels were on the rise when this project began and a nitrate load does exist in the vadose zone.

Many research projects have documented the relationship between nitrogen application and nitrate load in the vadose zone. One study, done in 1988, showed the movement of nitrate to a depth of 60 feet over a 15-year period under excessively fertilized plots. The vadose-zone (that area between the root zone and the groundwater) nitrate load was documented on several farms in the area from 1986 through 1990.

This substantial amount of nitrate is at depths that deep-rooted crops cannot reach. Comparison studies have been done on pastures having no history of nitrogen fertilization. The results suggest that the load is not natural, but has come from applied fertilizer.

The premise behind the Mid-Nebraska Project is that fertilizer and waste products are applied in much of the project area in a manner that allows excessive amounts of unused nitrate to reside in the soil. Poorly timed and/or poorly distributed irrigation water (combined with rainfall) then carries nitrate below the root zone. Records of residual nitrate in the root zone prior to fertilization for the next crop support the assumption of excess nitrogen application.

Pesticide contamination of the groundwater in this area is not widespread. The only pesticide found in the groundwater of this area with some regularity is atrazine.

The soils of this area have a medium to low leaching potential, according to Soil Conservation Service characterization. Computer models suggest that atrazine would not be expected to penetrate these soils to the groundwater. There is no current, conclusive evidence that atrazine in these wells is from a non-point source. Sites have been sampled to determine the extent of atrazine leaching

Best Management Practices Demonstrated

The Mid-Nebraska Water Quality Demonstration Project hopes to achieve its objectives through the use of demonstrated best management practices (BMPs).

Thirty-four irrigated-crop producers throughout the 15-county area have volunteered their land and time to establish sites that demonstrate the recommended best management practices for their locale and situation.

The practices to be demonstrated throughout the project area are:

1. Deep soil sampling and analysis to estimate available soil nitrogen.
2. Irrigation water testing to estimate the irrigation water nitrogen contribution.
3. Selecting realistic yield goals based on field history.
4. Irrigation scheduling to efficiently apply proper amounts of irrigation water.
5. Using irrigation flow meters to accurately measure applied irrigation water.
6. Using an integrated pest management (IPM) approach to minimize pesticide applications, and to optimize efficiency when applied.
7. Using irrigation surge valves to more uniformly apply irrigation water.

8. Using delayed nitrogen application (sidedress and/or fertigation) to more efficiently use fertilizer nitrogen.

9. Using nitrification inhibitors to delay nitrification, restrict leaching, and increase nitrogen use efficiency.

10. Allowing proper nutrient credits for preceding legume crops.

11. Allowing proper nutrient credits for manure, compost, sewage sludge and other waste.

12. Applying manures and other waste products by methods to allow efficient use of nutrients contained in the products.

13. Minimizing irrigation water runoff through the use of proper land leveling, reuse basins, and surge valves.

14. Using proper pesticide mixing and application procedures to prevent point-source contamination, either at the farmstead or in the field.

15. Using crop rotations to reduce nitrogen fertilizer use and impact of insect and weed infestations.

16. Using winter cover crops to retain residual soil nitrate between growing seasons.

A Demonstration Site

A demonstration site is an entire field owned and operated by a local producer/cooperator. A field history is developed by the operator in consultation with the local county extension educator, district conservationist and the project technologist. Problems, both routine and those unique to the site, are identified and the operator describes the management plan that will address these problems while still attaining a reasonable yield with minimum risk of chemicals leaching beyond the root zone.

A local committee, made up of producers and agency and agribusiness representatives from that county, has input on which practices should be highlighted as a demonstration for area producers. These specific practices are contained in the field at a smaller scale to minimize the risk associated with comparing against non-recommended practices that are in common use in the area.

Nitrogen Management Activities

Common to most of the demonstration sites are field-length strips showing nitrogen management. Each strip is the width of the nitrogen fertilizer applicator; a minimum of six rows wide. Each strip is under one treatment for the entire five-year duration of the project.

The nitrogen treatments are developed using a University of Nebraska-Lincoln formula that includes the following factors:

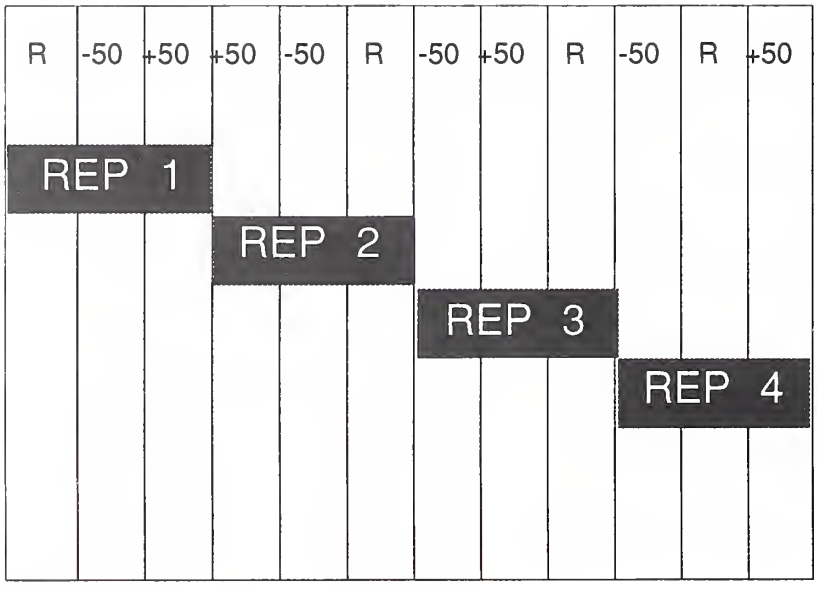
- Expected yield equals the average yield for the past five years, plus five percent.
- Research-based information for nitrogen required to meet the expected yield.
- Credit for soil nitrate in the root zone based on subsoil samples.
- Credit for irrigation water nitrate based on a nitrate test of well water during the previous season.
- Credit for previous legume crops such as soybeans or alfalfa.
- Credit for manure applications.

The nitrogen fertilizer is then applied in side-by-side comparison strips. The strips normally include the recommended rate, a rate of 50 pounds more nitrogen than recommended, and a rate with 50 pounds less nitrogen than recommended (see Figure 2). These three treatments are repeated four times in the field resulting in 12 nitrogen treatment strips.

The strips are combine-harvested, weighed in a weigh wagon and adjusted to 15.5 percent moisture. Soil samples are taken from each strip during the autumn. Nitrogen treatments for the next year are based on the residual nitrate in the recommended-rate strips.

University of Nebraska publications and software that address nitrogen management are listed below.

Figure 2. Example of plot layout for nitrogen rate strips.



R = UN-L recommended rate

Neb Guides

G74-174 *Fertilizer suggestions for corn*
G79-481 *Setting your corn yield goal is important*
G93-1178 *Fertilizer nitrogen best management practices*

Other Extension Publications/software

NF93-111 *New nitrogen recommendations for corn*
Soil Test Version 1.93, UNL Dept. of Agronomy

Irrigation Management Activities

Water management activities in a demonstration project are unlike nitrogen management activities in that replicated strip plots or trials are rarely possible. Statistically valid comparisons depicting the outcome or effect of practices are limited by land, labor, and time constraints, and are often severely confounded by the spatial variability of soil, water application, and topographic conditions.

The extent to which water management activities may be applied depends on the practices and conditions associated with each site. The activities promoted in this project are generally those which have had historically documented success, and have a high probability of success under the conditions of a given site.

The water management activities demonstrated in this project are:

1. proper irrigation scheduling methods
2. metering flows to reduce gross application
3. surge irrigation
4. irrigation systems alterations that reduce deep percolation
5. management strategies that encourage more effective water use.

In the water management activities of the MNWQDP, cooperators are encouraged to keep accurate and detailed information on their irrigation practices. This includes:

- Cooperators meter all irrigation applications and record rainfall amounts throughout the irrigation season.

- Cooperators are required to have access to an acceptable irrigation scheduling practice. The recommended irrigation scheduling methods include the checkbook (volume balance) method, appearance and feel techniques, the use of tensiometers, resistance blocks, or atmometers, computer based schedulers, or other advanced techniques. Day-to-day irrigation scheduling activities may be the responsibility of the cooperator, a commercial crop consultant, a project technologist, or an employee of a cooperating agency.

- Project personnel work closely with each cooperator to recommend different practices, or changes in existing practices, that have a high probability of enhancing the performance of the cooperator's irrigation system. Cooperators are presented with options that, if they so choose, may be implemented at their site. Project personnel then assist in the design, installation, operation and maintenance of the practices that the cooperator has designated, primarily in an advisory or technical assistance role.

A major principle associated with water management activities is that the wholesale adoption of historically proven practices can only result in positive changes in the interaction between on-farm water management and groundwater quality and quantity.

University of Nebraska publications that address irrigation management are listed below.

Neb Guide

G77-340	*Scheduling irrigations by electrical resistance blocks*
G78-392	*Selecting and using irrigation propeller meters*
G78-393	*Water measurement calculations*
G83-690	*Estimating soil moisture by appearance and feel*
G88-753	*Irrigation scheduling using crop water use data*
G91-1017	*Application of surge irrigation*
G91-1018	*Fundamentals of surge irrigation*
G91-1021	*Managing furrow irrigation systems*

Other Extension Publications

EC91-735	*The impact of nitrogen and irrigation management and vadose zone conditions on ground water contamination by nitrate-nitrogen*

Pest Management Activities

Pests include insects, weeds and diseases. They are considered manageable factors in crop production. An integrated approach is one that includes cultural practices and pesticides when appropriate. Accurate field information is the key to integrated pest management (IPM).

Some of the cultural practices that reduce the risk to groundwater are crop rotation, cultivation, and the placement, timing, selection and rate of pesticide application.

Crop rotation helps in several ways. Corn rootworm insecticide is usually eliminated as the beetles will not lay significant numbers of eggs in the rotated crops. Alternating types of plants (grasses and broadleaf, annual and perennial) disrupts the environment for weeds and insects. This disruption and increased herbicide alternatives, often reduces the need for herbicides.

Crop rotation also enhances **cultivation**. Weed pressure is often reduced and banded herbicide treatments are more likely to keep the rows clean.

Placement, timing, selection and rate of pesticide use controls the product effectiveness. Treatments that are poorly applied lead to reduced yields, or re-treatment -- a costly outcome in either case. Most herbicide treatments are banded to reduce quantity and expense, relying on the cultivator for weed control between rows. Rootworm soil insecticides are more effective if applied at first cultivation. European corn borer control and rootworm beetle control are also affected by timing of application.

All of the pest control decisions revolve around **accurate field scouting data**. Field maps that identify areas with particular weed problems or soil insects are of particular use. Accuracy in scouting is dependent on number of areas sampled and location of those areas. Two or three locations near field borders are not adequate for developing an accurate picture of what is occurring in the field.

University research-based thresholds are used when possible. These thresholds are classified as static (those which have a set level) and dynamic (those which have variables). Corn rootworm management utilizes a static threshold while European corn borer management uses dynamic thresholds for first and second generations.

Incomplete data is of little use. For example, European corn borer treatment thresholds have been developed through extensive University research. To adequately use these threshold calculations for first generation borer, one must know percentage of plants with shotholes plus the number of live borers per plant. Since the thresholds have been developed based on amount of crop loss per live borer, merely knowing percent shotholed plants is inadequate.

The threshold number of beetles for 27,000 plants per acre corn population is two-thirds beetles per whole plant or one-third beetle per ear zone. This static threshold is calculated by dividing 18,000 by the plant population to arrive at beetles per whole plant. If only the ear zone is counted, this figure is divided by two.

The threshold for first-generation European corn borer is a dynamic one related to live larvae counts, treatment costs, treatment effectiveness and the value of corn that can be saved. Table 1 (page 10) is a tool to determine the threshold number of live borers per plant with 75 percent control from a chemical treatment, which is typical. Three values of corn are given, as well as two costs of treatment for several different yield potentials. One must interpolate different corn prices or treatment costs since the relationships are linear.

Second generation European corn borer also has a dynamic threshold. Table 2 (page 10) gives the same variables as seen with first-generation borer, plus the added variable of stage of plant growth. Another variable, larvae survival with no treatment is assumed to be 17.5 percent in this table. Select the stage of growth and value of corn; then find where this intersects current yield expectation and treatment cost. The resulting number is the egg masses per plants checked in percent at the break-even level of infestation.

University of Nebraska publications that address integrated pest management are listed below.

Neb Guides

G75-217	*European corn borer*
G77-382	*Right crop stage for herbicide use*
G79-471	*Choice of corn hybrids*
G81-613	*Ear attacking insects of corn*
G86-774	*Western corn rootworm soil insecticide treatment based on beetle numbers*
G87-839	*Corn rootworm control*
G89-904	*Corn insects - quick reference*
G91-1031	*How to hire a crop consultant*

Other Extension Publications

EC91-130	*Herbicide use in Nebraska--guide*
EC92-1509	*Insect management guide for Nebraska corn and sorghum*
EC92-1511	*Insect management guide for Nebraska alfalfa, soybeans, wheat, range and pasture*

Table 1. Threshold number of live borers per plant

Yield Expected (bu/acre)	160		170		180		190		200		210	
Treatment Cost ($/acre)	5	10	5	10	5	10	5	10	5	10	5	10
$2.00/bu	0.42	0.83	0.39	0.78	0.37	0.74	0.35	0.7	0.33	0.67	0.32	0.63
$2.50/bu	0.33	0.67	0.31	0.63	0.3	0.6	0.28	0.56	0.27	0.53	0.25	0.51
$3.00/bu	0.27	0.55	0.26	0.52	0.25	0.5	0.23	0.46	0.22	0.44	0.21	0.42

- Number live borers per plant is calculated by multiplying percent shotholed by the average live larvae per shotholed plant
- Assumes 75 percent control from treatment

Table 2: Threshold percent egg masses for treatment of second-generation ECB[1] [(egg mass/plants checked) X 100]

Growth Stage	Yield Expectation (bu/acre)	160		170		180		190		200		210	
	Treatment Cost ($/acre)	12	8	12	8	12	8	12	8	12	8	12	8
Pollenation	$2.00/bu	30	20	28	19	26	18	25	17	24	16	23	15
	$2.50/bu	24	16	22	15	21	14	20	13	19	13	18	12
	$3.00/bu	20	13	19	12	18	12	17	11	16	10	15	10
Blister	$2.00/bu	38	25	36	24	34	23	32	21	30	20	29	19
	$2.50/bu	30	20	29	19	27	18	26	17	24	18	23	15
	$3.00/bu	25	17	24	16	23	15	21	14	20	14	19	13
Milk	$2.00/bu	44	30	43	28	39	26	37	25	35	24	34	23
	$2.50/bu	35	24	33	22	32	21	30	20	28	19	27	18
	$3.00/bu	30	20	28	19	26	18	25	17	24	16	23	15
Dough	$2.00/bu	67	44	63	42	59	39	56	37	53	35	51	34
	$2.50/bu	53	35	50	33	47	32	45	30	43	28	40	27
	$3.00/bu	44	30	42	28	39	26	37	25	35	24	34	23

[1]Assumes 23 eggs per mass & 17 1/2 percent larvae

Summary of Results - 1993

South Central Nebraska suffered another year of serious crop losses related to weather. Plots were lost to frost and hail in 1992 and high winds in 1993. Both years were characterized by abundant moisture during part of the growing season. Nitrogen losses were abnormally high in the two years due to wet conditions. Wind damage, diseases and poor growing conditions led to low yields across the project area in 1993.

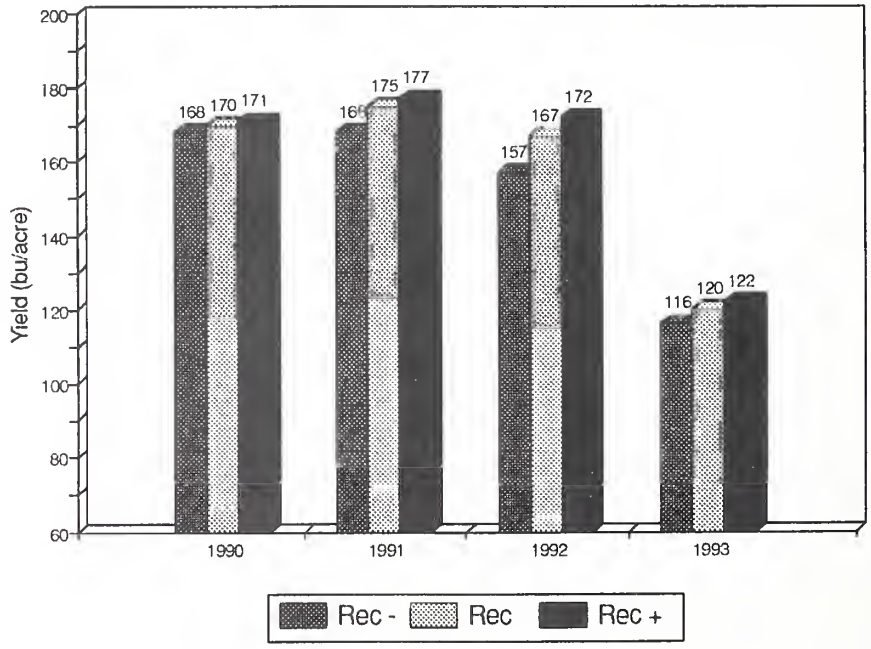
Nitrogen Management

Nitrogen (N) fertilizer rate comparisons were made at 27 demonstration sites in 1993. At 26 of these sites N fertilizer was applied in replicated, field-length strips at the recommended N rate and rates 50 pounds per acre above and below the recommended rate. The recommended rate was determined by following the University of Nebraska procedures, including credits for N available from soil, irrigation water, legumes and manure. The 1993 revised algorithm was used.

Soil samples were taken to a depth of four feet to determine residual soil nitrate levels on 25 of the sites. Three sites had legume credits for soybeans as the previous crop. Irrigation water credit for nitrate nitrogen was made on 24 sites ranging from two to 36 pounds per acre. Most sites relied on 1991 irrigation tests for nitrate due to the lack of irrigation in 1992. The credit assumed nine inches of water would be applied.

The average expected yield for the 27 sites with N rate strips was 178 bushels per acre, with a range from 160 to 215 bushels per acre. The recommended way to set an expected yield was to use five-year average yields plus five percent. Abnormal years were discarded. For example, 1993 was an abnormal year that should not be considered in the 1994 expected yield calculation.

Figure 3. Average plot yields by treatment, 1990-1993



The average yields for the 26 sites with comparison strips were:

- recommended rate - 120 bu/a
- -50 lb/acre rate - 116 bu/a
- +50 lb/acre rate - 122 bu/a

Figure 3 (page 11) shows the results of nitrogen rate comparison plots for the four years of the Mid-Nebraska project. Comparing high and recommended rates generally resulted in no statistically significant difference with averages within two bushels of each other. Many of the low rates depress yields significantly and often at a cost that was greater than the cost of additional nitrogen. These results demonstrate that **the recommended rate does not maximize yields, but it does minimize risk and, generally, it maximizes profit.**

Irrigation Water Management

All of the 35 sites were irrigated acres. Irrigation water was monitored with flow meters at 31 of the sites. Most sites did not receive irrigation in 1993 until late in the season.

The average rainfall on the sites was 21.4 inches. The average gross irrigation on the gravity irrigated corn sites was 2.3 inches per acre.

Irrigation scheduling was provided by the consultants and technologists in most cases. Some farmers provided their own scheduling and one hired the Blue River Association of Groundwater Conservation Districts to schedule. The checkbook method or some version of it was used in all cases. This system estimated available water and expected crop water use. It provided an estimate of the date to irrigate in order to prevent soil water depletion that would restrict yields. Soil moisture was estimated using moisture blocks at eight sites. All other sites relied on the hand-feel method.

Irrigation on gravity flow systems was complicated this year by the abundant debris in the rows from wind damage. An "every-other-row" technique was used at nine sites. Thirteen sites had reuse pits. Surge valves were in place at 11 other locations.

Integrated Pest Management

Field scouting reports were the basis for treatment decisions on the project demonstration sites. Most fields were scouted by crop consultants. University research-based thresholds were used. Some thresholds were modified by the consultants based on their experience with specific sites and the decisions to treat or not to treat were made by the farmer who used his values for yield potential, treatment cost and crop value. Scout reports were collected and summarized for 17 of the demonstration fields.

Rootworm management is important under continuous corn. Twenty-five of the demonstration sites were planted to corn in both 1992 and 1993. The rootworm beetle control program was used at nine locations. Seven sites using beetle control had counts that exceeded the threshold and four of these fields were sprayed once aerially with Penncap-M to kill the beetles. Three fields were sprayed two times due to reinfestation. Two other fields were sprayed once, although thresholds were not reached. Some farmers had to decide based on little information about counts on storm-damaged fields.

Low beetle numbers on ten fields indicated rootworm larvae pressure in 1994 is not likely to reach treatment thresholds. If those fields are planted to corn in 1994, no soil-applied insecticide will be needed for rootworm.

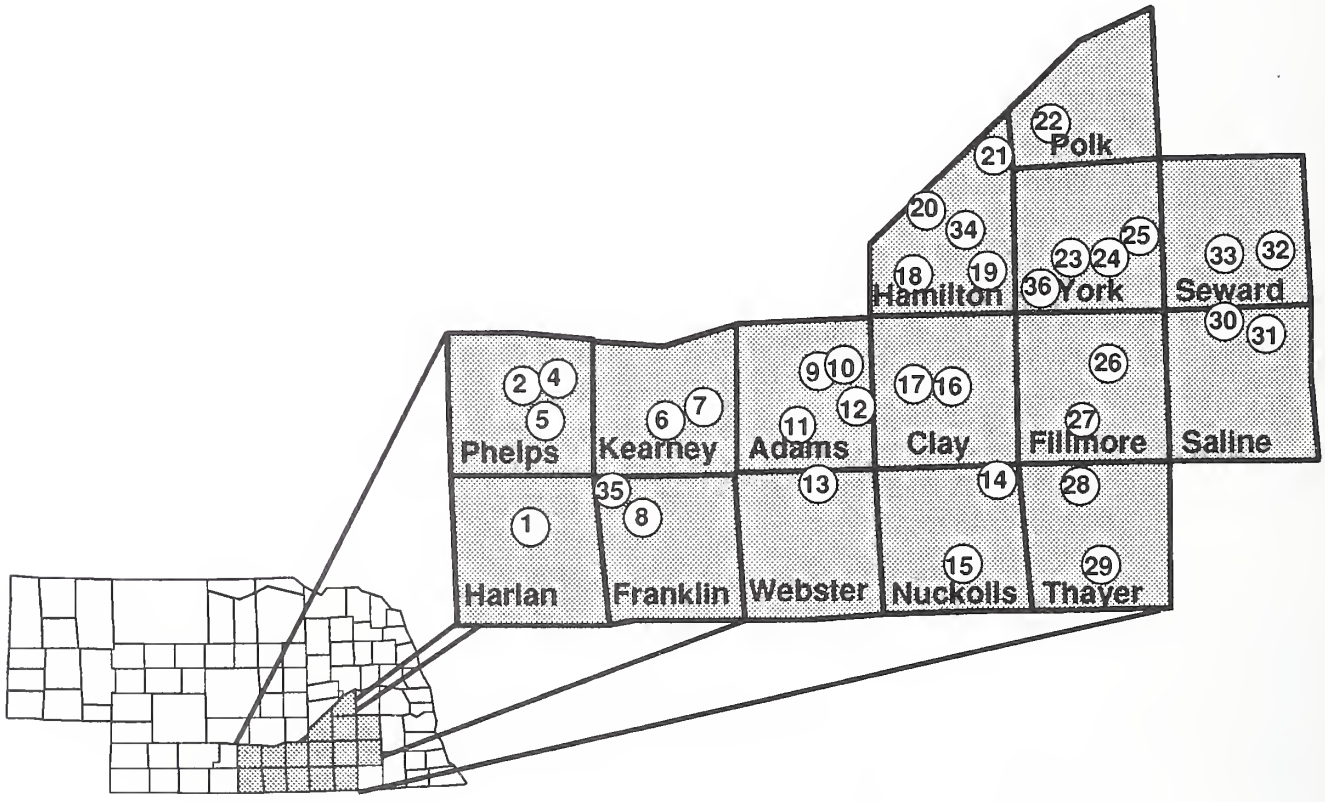
European corn borer can cause problems from either of the two generations that are present from June through September. Only two sites had significant infestations of first generation borer; one was treated and the other was not, due to the late date when the threshold was reached.

Second generation corn borer never exceeded the threshold at the 17 sites that were tracked. None of the sites were treated for second generation European corn borer, but rootworm beetle control surely had a corn borer control effect.

WATER QUALITY

Mid-Nebraska Demonstration Project

The project staff would like to thank the following for providing demonstration sites in 1993



1 Al Hollertz
2 Chris Erickson
4 Lloyd Erickson
5 Bruce Anderson
6 Dean Casper
7 Dave Nielsen
8 John Jelken
9 Milton Ruhter
10 Ramsey/McLeod
11 Larry Christensen
12 Bruce Bohlen
13 Kevin Karr
14 Lale Oellerich
15 Don Kottmeyer
16 Steve Yost
17 Dave Hamburger
18 Clayton Higgins
19 Carey Friesen
20 Curt Carlson
21 Joel Anderson
22 Mark Newcomer
23 Jerry Stahr-Pivot
24 Jerry Stahr-Gravity
25 Brad Rathje
26 Howard Lefler
27 Jim Bedlan
28 Leroy Voss
29 Effenbeck Farms
30 Keith Spohn
31 Wayne Hansen
32 Dean Rocker
33 Doug Cast
34 The Grain Plac
35 Butch Ortgiesen
36 Brian Janzen

Table 1. Summary of practices and results from all the 1993 demonstration sites.

	--Used in N rate recommendation--		--Measured during season--					
	Yield Goal	Res. Soil NO_3-N	Gross Rainfall	Gross Irrig.	NO_3-N Content	Gross Water N Applied	Nitrogen Rate	Yield
Plot	bu/a	lb/a-4ft	in	in/acre	ppm	lb/a	lb/a	bu/a
1	175	68	21.60	0.00	6.4	0.00	40 90R 140	134.8a 136.2a 136.4a
6	175	16	26.10	0.00	1.5	1.48	124 174R 224	90.2c 99.5b 108.1a
8	160	43	25.05	0.00	6.4	11.30	74 124R 174	130.4a 132.4a 132.8a
9	160	53	23.22	0.00	3.1	0.00	79 129R 179	94.3a 94.0a 95.6a
17	175	39	22.10	5.49	3.1	6.42	128 178R 228	94.8a 95.4a 94.9a
19	180	40	24.27	0.00	2.2	1.48	151 201R 251	143.4a 144.7a 141.9a
12	160	111	18.65	0.00	8.6	0.00	51 101R 151	7.8 7.3 6.1
14	175	35	28.10	0.54	3.6	0.44	110 160R 210	149.2b 153.4a 153.6a
14	180	57	22.83	0.00	3.6	.81	86 136R 186	125.8ab 137.9a 122.8b
15	180	40	n/a	0.00	n/a	0.00	90 140R 190	147.2a 149.8a 155.9a
16	180	57	24.30	0.00	2.8	0.00	11 41 71 101R	97.9bc 102.0b 108.3a 96.5c
17	190	84	26.00	0.00	6.4	0.00	79 129R 179	139.2a 136.4ab 132.2b
19	190	75	19.70	2.44	8.6	4.72	65 115R 165	114.4a 117.2a 122.6a
20	215	28	15.60	8.49	10.2	19.48	176 176R 226	136.7a 137.9a 140.8a

[1]Yields with the same letter are not significantly different at the five percent level of significance, using Duncan's Multiple Range Test

AA=Anhydrous Ammonia
LIQ=Liquid
R=Recommended

	--Used in N rate recommendation--		--Measured during season--					
	Yield Goal	Res. Soil NO_3-N	Gross Rainfall	Gross Irrig.	NO_3-N Content	Gross Water N Applied	Nitrogen Rate	Yield
Plot	bu/a	lb/a-4ft	in	in/acre	ppm	lb/a	lb/a	bu/a
21	175	41	20.95	5.67	0.9	12.12	82 132R 182	103.4b 117.9a 119.7a
22	180	66	n/a	1.73	5.6	2.18	38 88R 118	149.1a 145.0b 149.7a
23	185	37	19.95	0.00	n/a	0.00	116 166R 216	105.8a 110.0a 109.9a
24	180	41	18.00	4.75	9.7	10.37	104 154R 204	139.4b 145.8a 146.8a
25	200	38	19.95	5.67	0.9	0.00	98 98 98	96.3 97.2 99.2
26	180	50	23.50	0.00	1.7	0.00	108 158R 208	114.2b 118.5a 118.9a
27	180	65	17.05	0.00	9.7	2.10	92 142R 192	99.8a 109.8a 107.5a
28	160	28	12.22	3.73	6.3	5.29	88 138R 188 210	91.8b 102.0a 104.7a 102.2a
29	170	35	29.65	0.00	5.6	0.00	93 143R 193	72.6b 68.6b 87.1a
31	170	30	27.4	0.00	1.9	0.00	99 149R 199	80.1c 87.8b 97.8a
33	180	41	n/a	0.00	17.6	0.00	106 156R 206	101.0b 105.3ab 106.9a
35	175	41	17.05	12.71	0.9	0.00	121 171R 221	120.7b 130.2a 134.0a
36	170	57	26.3	9.00	2.7	5.47	130 180R 230	117.2b 120.8a 120.3a

[1]Yields with the same letter are not significantly different at the five percent level of significance, using Duncan's Multiple Range Test

AA=Anhydrous Ammonia
LIQ=Liquid
R=Recommended

Individual Demonstration Plot Data Summaries

Please note:

Each site is unique; not all practices are demonstrated at each site. The basic format includes General Information, Nitrogen Management, Irrigation Management, Integrated Pest Management & Vadose Zone Nitrate information. Some sites will have information on all of these categories, while others may not, depending upon the individual practices of each cooperator.

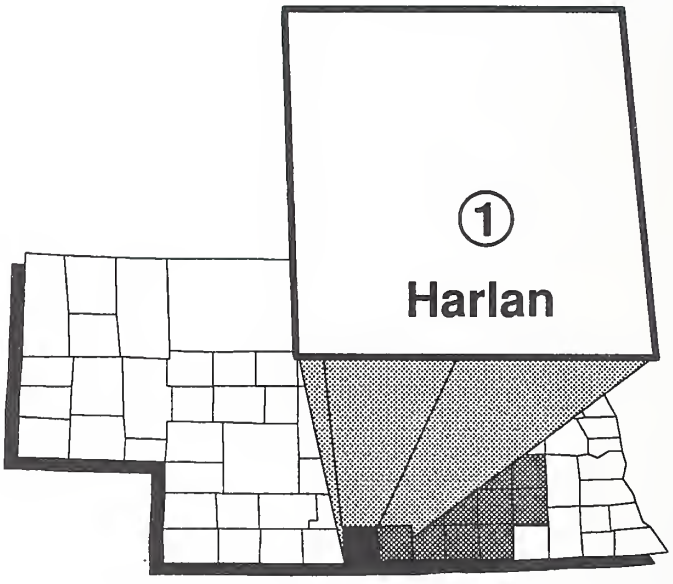
Site 1

Al Hollertz - Harlan County

General Information:

Site 1 is located seven miles south and two miles east of Holdrege on the Al Hollertz farm in Harlan County. This field has been in a corn/soybean rotation. The soil type is a Holdrege silt loam with a 0-1 percent slope.

Al disked May 16 before planting Northrup King 6330 on May 18.



Nitrogen Management

Al included nitrogen rate comparison plots in this field. The plots were six rows wide, 1263 feet long and replicated four times. Al's plot received five percent stalk breakage from the July 8 wind storm and 35 percent hail loss. He broadcast applied 34 pounds of phosphate and two pounds of zinc, combined with herbicide on May 23. Al sidedressed anhydrous ammonia in the bottom of the furrow on June 20.

The recommended rate of nitrogen was determined using a 175-bushel expected yield. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 6.7 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.7
OM	2.40%
P	14 ppm
K	428 ppm
Zn	.95 ppm
S	4 ppm

Treatment-1993	-50	Rec	+30
N rate (lbs/acre)	40	90	140
Yield avg. (bu/acre)	135	136	136
Test wt. (lbs/acre)	54	54	54
Moisture (%)	21	20.5	20.2

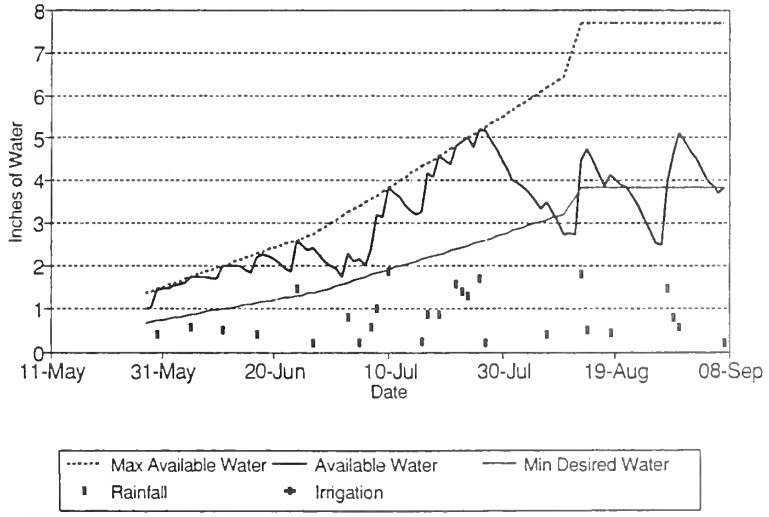
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				60	165		
1990	**Rec**		126	175	110	166		
	50+				160	170		
	-50		55		110	167		
1991	**Rec**	14	50	175	160	172	Avg. N	Avg.
	50+		54		210	173	Applied	Yield
	-50		56		40	135	70	156
1993	**Rec**	14	68	175	90	136	120	158
	50+		65		140	136	170	160

Irrigation Management

This site is gravity irrigated, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 21.60 inches of rainfall between May 28 and September 7. There was no irrigation application in 1993.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



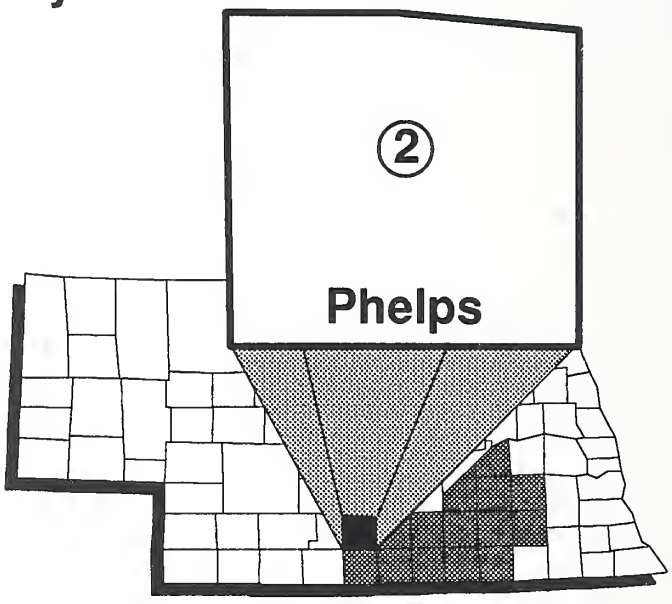
Integrated Pest Management:

Al rotated this field to avoid corn lethal necrosis(CLN) problems. The field is known to have a history of maize chlorotic mottle virus, one of the two agents that causes CLN.

His herbicide program consisted of Dual, broadcast at one quart on May 23. Insecticides were not used in 1993.

Site 2

Chris Erickson - Phelps County



General Information:

Site 2 is located on the Chris Erickson farm three miles east, two miles north and $^1/_4$ mile east of Holdrege. The field has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

Chris disked in the fall and field cultivated on April 23 when he planted Pioneer 3417 in 36-inch rows.

Nitrogen Management

Chris included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1335 feet long and replicated four times. Chris' field sustained 95 percent green snap from the July 8 wind storm. Consequentially there was no harvest data available. He sidedress applied anhydrous ammonia on June 10.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 7.8 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.3
OM	3
P	22 ppm
K	423 ppm
Zn	1.77 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	61	111	61
Yield avg. (bu/acre)			
Test wt. (lbs/acre)			
Moisture (%)			

Irrigation Management

This site is gravity irrigated, watering alternate (every other) furrows. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 9.8 inches of rainfall between May 5 and August 16. There were no irrigation applications in 1993.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

Integrated Pest Management:

Chris's herbicide program included 1.8 quarts of Bicep II banded at planting followed by banded treatments of Beacon and Banvel on June 2.

Site 4

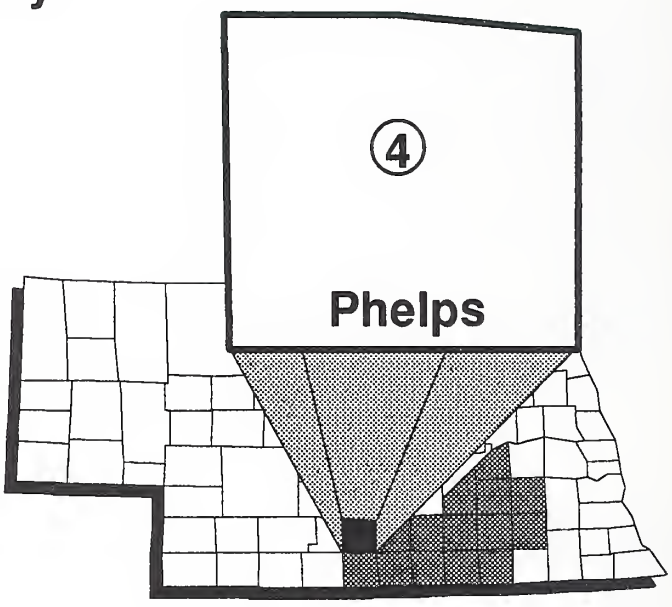
Lloyd Erickson - Phelps County

General Information:

Site 4 is located three miles north and $^1/_4$ mile east of Holdrege on the Lloyd Erickson farm in Phelps County. This gravity-irrigated field has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

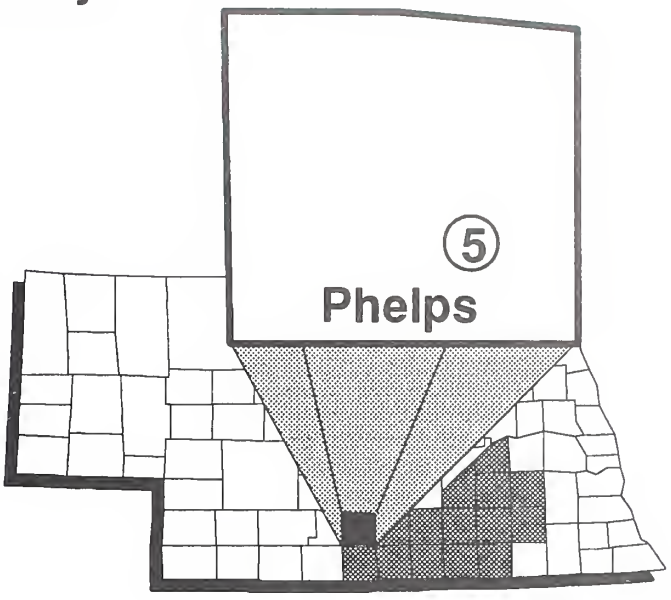
Lloyd shredded stalks and disked in the fall, prior to planting Pioneer 3245 on April 25 in 36-inch rows.

Lloyd sustained 15 percent wind damage in the July 8 windstorm. No further data is available.



Site 5

Bruce Anderson - Phelps County



General Information:

Site 5 is located one mile north and one mile east of Sacramento in Phelps county at the Bruce Anderson farm. The soil type is a Holdrege silt loam with a 1-3 percent slope.

Bruce shredded stalks on May 3 prior to planting Bojac 520 and Pioneer 3394 in 36-inch rows on May 20.

Nitrogen Management

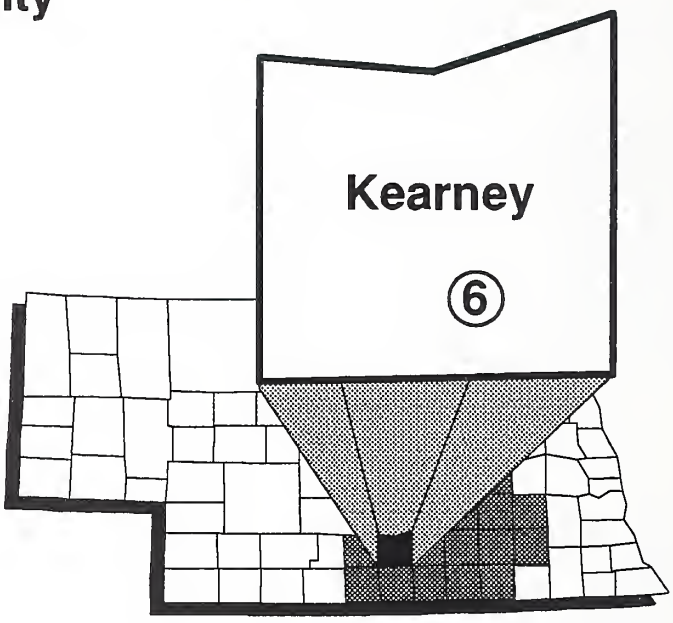
Bruce did not have nitrogen rate comparison plots in this field. He applied 28-0-0 on May 5.

Irrigation Management

This site is gravity irrigated, watering alternate (every other) furrows. Soil moisture blocks and a surge valve were used. The field received 14 inches of rain between June 16 and August 16. No irrigation information was available.

Site 6

Dean Casper - Kearney County



General Information:

Site 6 is located on the Dean Casper farm five miles south, three miles west and $^{3}/_{4}$ mile south of Minden in Kearney County. This site has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

Dean shredded stalks on April 22 prior to ridge planting Pioneer 3394 on May 5 in 36-inch rows.

Nitrogen Management

Dean included nitrogen rate comparison plots in this field. The plots were six rows wide, 1254 feet long and replicated four times. Dean's yields were lower in 1993 due to 10 percent stalk breakage from the July 8 wind storm. He applied anhydrous ammonia preplant on April 24.

The recommended rate of nitrogen was determined using a 175-bushel expected yield. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 1.5 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.8
OM	2.40%
P	13 ppm
K	439 ppm
Zn	.74 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	124	174	224
Yield avg. (bu/acre)	90	99	108
Test wt. (lbs/acre)	55	55	55
Moisture (%)	14.8	15.4	15.9

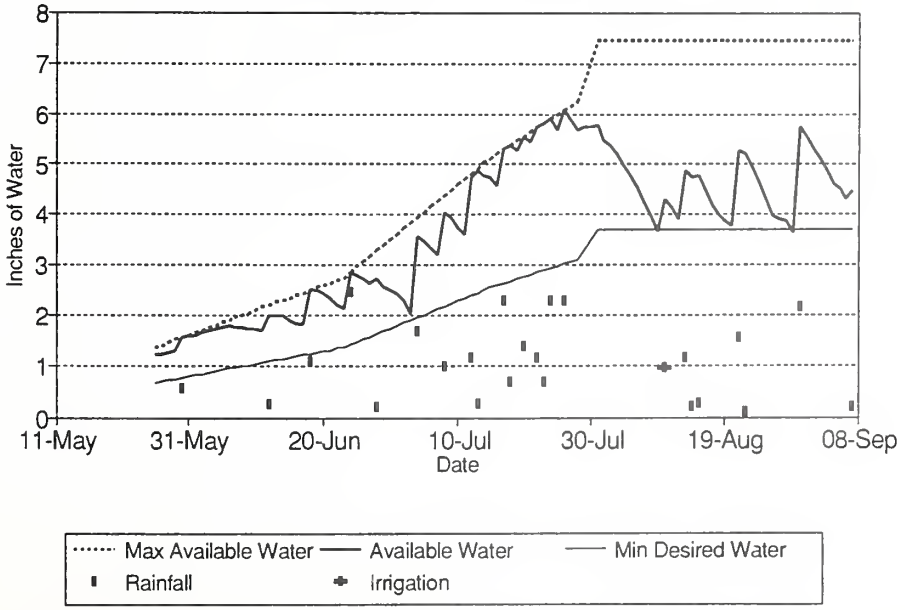
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				75	148		
1990	**Rec**		110	175	125	165		
	50+				175	173		
	-50	2	25		148	140		
1991	**Rec**		33	175	198	160		
	50+		29		248	172		
	-50	3	10		158	139		
1992	**Rec**		13	175	208	148	Avg. N Applied	Avg. Yield
	50+		14		258	153		
	-50		20		124	90	126	129
1993	**Rec**	3	16	175	174	99	176	143
	50+		21		224	108	226	152

Irrigation Management

This site is gravity irrigated using a surge valve, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 26.10 inches of rainfall between May 15 and September 7 and .96 inches of water was applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



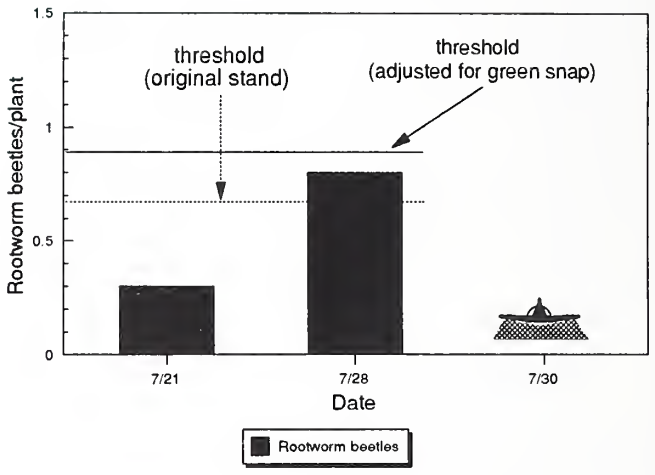
Integrated Pest Management:

Dean cultivated once for weed control and hilled. He applied 1.2 quarts of Lariat in a band on May 5 and broadcast applied Marksman on June 2.

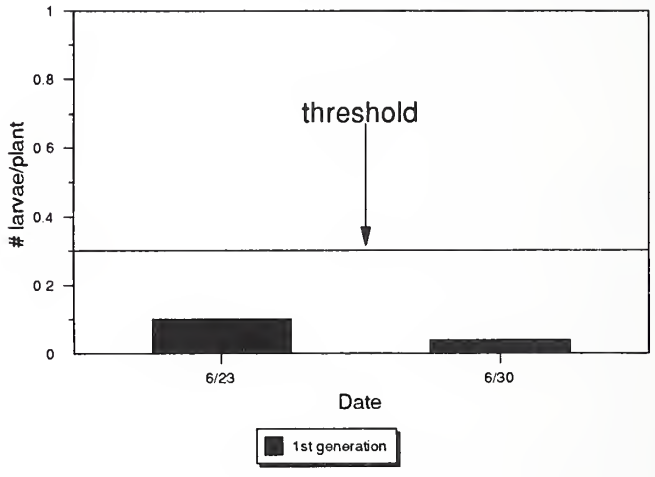
Rootworm beetles nearly reached the threshold on July 28, if based the threshold on the original stand. It was not reached based on the stand that remained after the wind. This was a difficult decision and Dean chose to treat on July 30.

European corn borer were not a problem for either generation.

Rootworm Management



Corn Borer Management



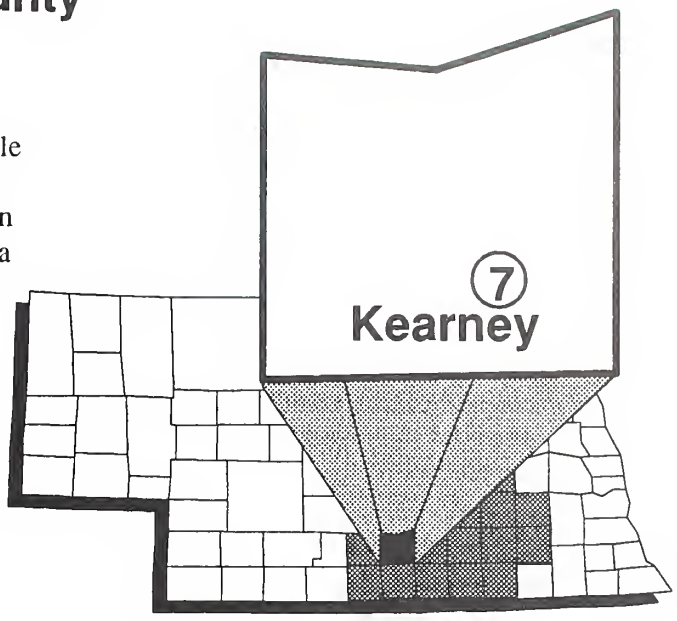
Site 7

Dave Nielsen - Kearney County

General Information:

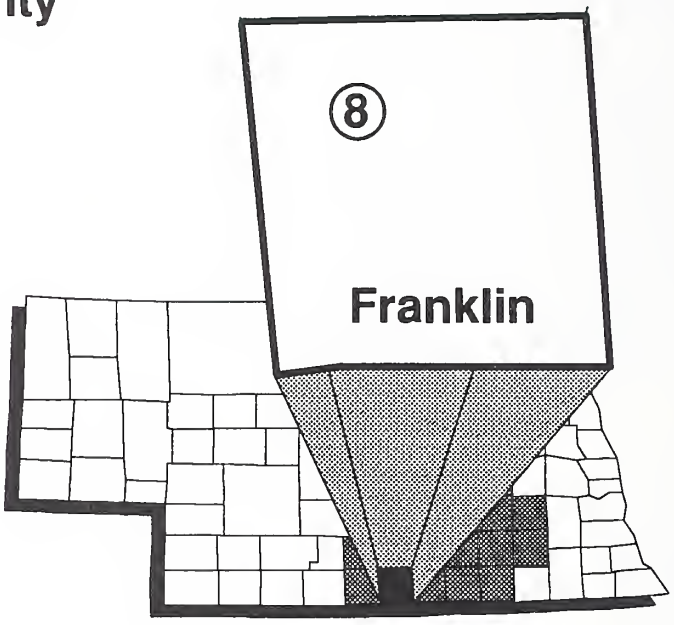
Site 7 is located on the David Nielsen farm one mile south and $^1/_2$ mile east of Minden in Kearney County. This gravity-irrigated farm has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

No irrigation or harvest data is available in 1993.



Site 8

John Jelken - Franklin County



General Information:

Site 8 is located on the John Jelken farm five miles south and two miles west of the Hildreth corner on Highway 4 in Franklin County. This field has been in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

John shredded stalks on April 30 prior to ridge planting Pioneer 3299 in 36-inch rows on May 6.

Nitrogen Management

John included nitrogen rate comparison plots in this field. The plots were 20 rows wide, 711 feet long and replicated four times. John broadcast applied nitrogen with a floater using 32-0-0 on May 15.

The recommended rate of nitrogen was determined using a 160-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 160 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 9.0 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.5
OM	3
P	19 ppm
K	504 ppm
Zn	4.47 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	74	124	174
Yield avg. (bu/acre)	130	132	133
Test wt. (lbs/acre)	52	52	52
Moisture (%)	19.5	20.2	20.2

Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				120	184		
1990	**Rec**		47	160	170	186		
	50+				220	176		
	-50		34		100	186		
1991	**Rec**	18	49	160	150	182		
	50+		64		200	188		
	-50		54		80	163		
1992	**Rec**	18	64	160	130	171	Avg. N Applied	Avg. Yield
	50+		49		180	168		
	-50		57		74	130	94	166
1993	**Rec**	18	43	160	124	132	144	168
	50+		69		174	133	194	166

Irrigation Management

This site is gravity irrigated using a surge valve, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 25.05 inches of rainfall between June 18 and August 30 and 5.58 inches of water was applied in one irrigation.

Integrated Pest Management:

John and Gene Jelken cultivated twice for weed control and hilled. They broadcast applied Bicep II on May 15 at 1.8 quarts.

The field was sprayed on August 9 with two pints of Penncap-M.

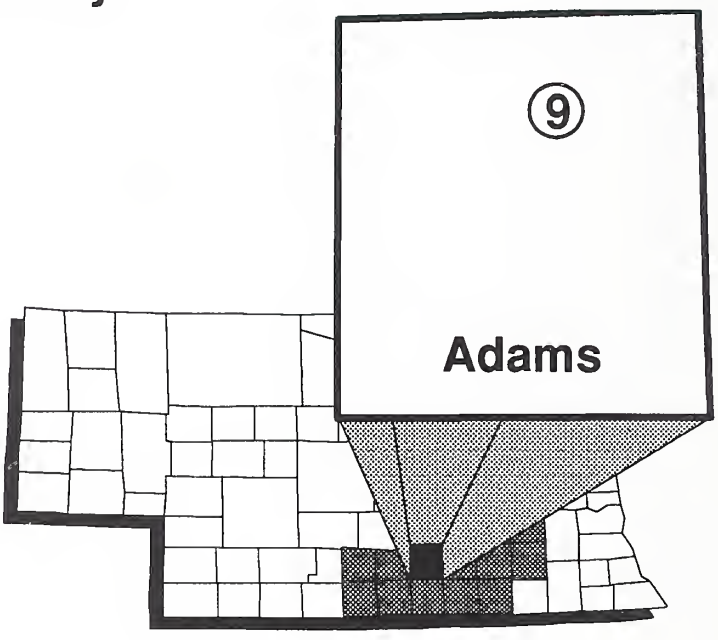
Site 9

Milton Ruhter - Adams County

General Information:

Site 9 is located on the Milton Ruhter farm $2^1/_2$ miles south of Prosser in Adams County. A corn/soybean rotation has been the practice on this site. The soil type is a Hord silt loam with a 0-1 percent slope.

This field was planted to soybeans in 1992. Milton planted OHLDE 220 on April 27 in 36-inch rows.



Nitrogen Management

Milton included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2139 feet long and replicated four times. Milt's yields were below average this year due to 65 percent green snap from the July 8 wind storm. He split-applied nitrogen using 28-0-0. He applied 10 gallons in a band at planting on April 27 and he applied 33.5 gallons at hilling on June 21.

The recommended rate of nitrogen was determined using a 190-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 190 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation water accounted for 3.1 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.3
OM	2.00%
P	52 ppm
K	497 ppm
Zn	2.41 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	79	129	179
Yield avg. (bu/acre)	94	94	96
Test wt. (lbs/acre)	58	57	58
Moisture (%)	16.2	15.8	16.6

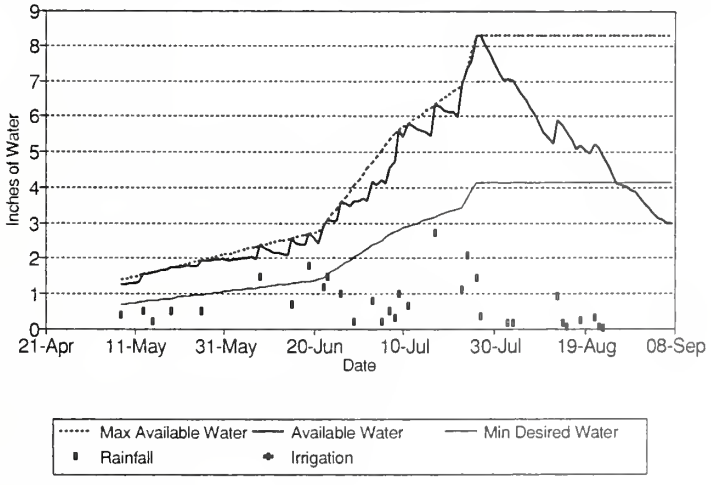
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)
	-50				90	174
1990	**Rec**		51	180	140	172
	50+				90	177
	-50				65	179
1991	**Rec**	8	76	190	115	184
	50+				165	188
	-50		58		75	188
1992	**Rec**	6	60	190	125	185
	50+		55		175	194
	-50		51		79	94
1993	**Rec**	6	53	190	129	94
	50+		55		179	96

Irrigation Management

This site is gravity irrigated, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 23.22 inches of rainfall between May 8 and September 7. There was no irrigation applications in 1993.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

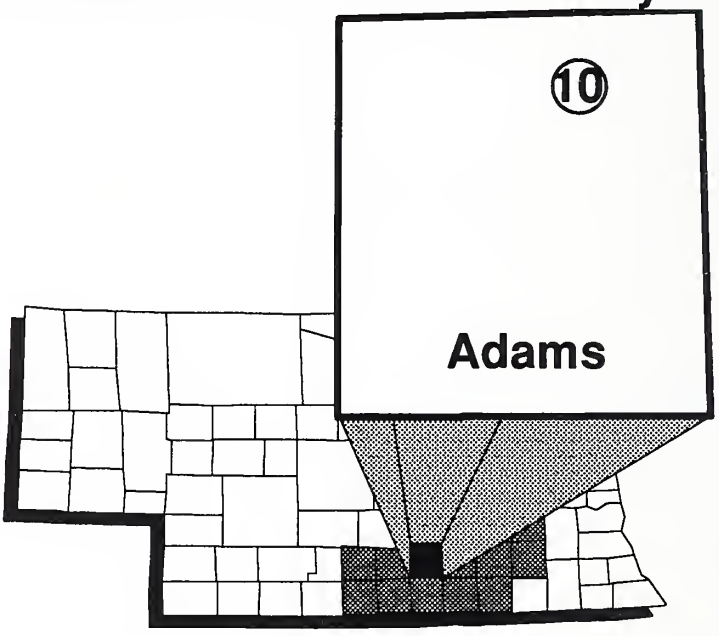


Integrated Pest Management:

Milton did not cultivate in 1993. The field was hilled for irrigation. Weeds were controlled by Bicep II banded on April 27. Milt scouted his own field and decided insect treatments were not warranted.

Site 10

Site 10 Myles Ramsey/William McLeod - Adams County



General Information:

Site 10 is located on the William McLeod farm one mile south and $^1/_2$ mile east of Prosser in Adams County. The soil type is a Kenesaw silt loam with a 0-1 percent slope.

William and Myles ridge planted NC+ 4616 in 36-inch rows on May 15.

Nitrogen Management

Myles and William included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 2620 feet long and replicated four times. Their yields were below the yield goal in 1993 due to 25 percent green snap from the July 8 wind storm. They split applied nitrogen with eight gallons 28-0-0 and two gallons 12-0-0-26S, placed in a 2X2 band at planting. They sidedressed anhydrous ammonia in the bottom of the furrow on June 22.

The recommended rate of nitrogen was determined using a 170-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 170 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 5.2 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	7.1
OM	1.20%
P	25 ppm
K	275 ppm
Zn	2.78 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	128	178	228
Yield avg. (bu/acre)	95	95	95
Test wt. (lbs/acre)	53	53	53
Moisture (%)	15.9	16.2	15.8

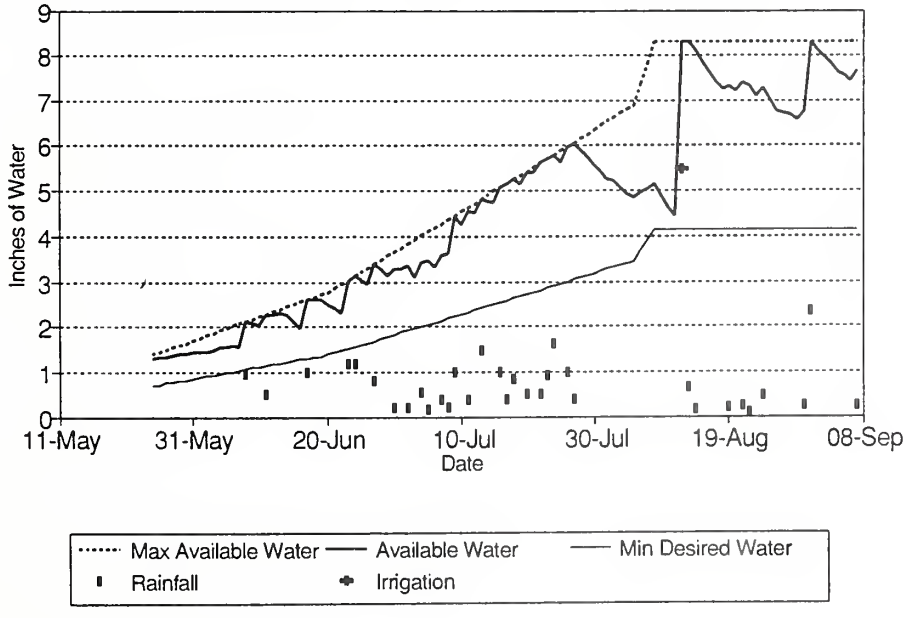
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				120	161		
1990	**Rec**		58	170	170	163		
	50+				220	162		
	-50		36		118	166		
1992	**Rec**	11	39	170	168	173	Avg. N Applied	Avg. Yield
	50+		46		218	175		
	-50		33		128	95	122	141
1993	**Rec**	11	39	170	178	95	172	144
	50+		70		228	95	222	144

Irrigation Management

This site is gravity irrigated using a surge valve, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 22.10 inches of rainfall between May 25 and September 7 and 5.49 inches of water was applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



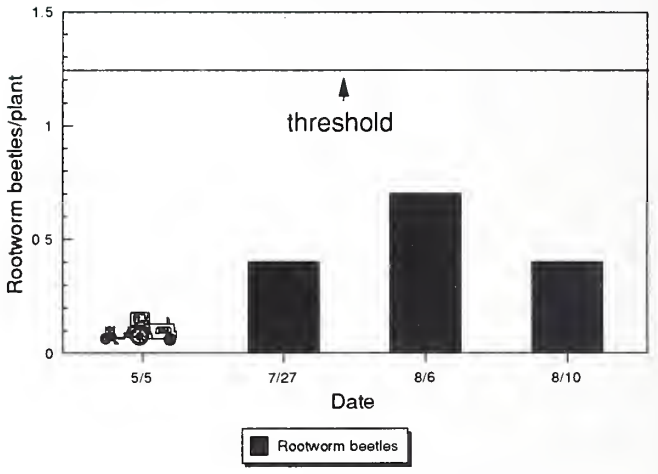
Integrated Pest Management:

The field was cultivated once and hilled. Myles and William's herbicide use was 1 quart of Bicep II banded on May 15.

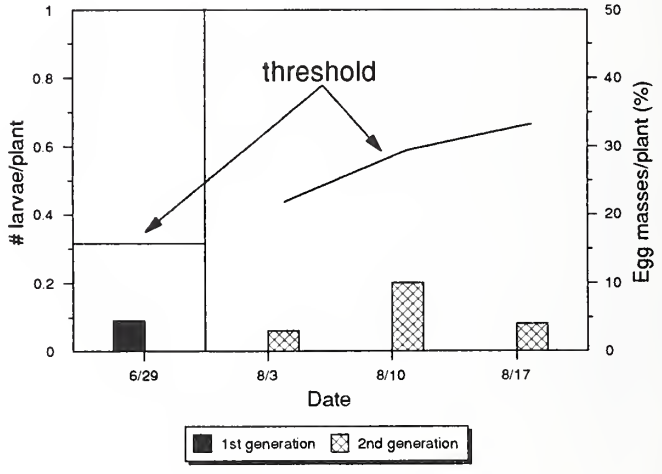
Rootworm control was obtained by banded application of Dyfonate II on May 15. The beetle numbers did not reach the threshold, so they could do without soil insecticide if they plant corn here in 1994.

European corn borer did not reach threshold levels for either generation.

Rootworm Management



Corn Borer Management



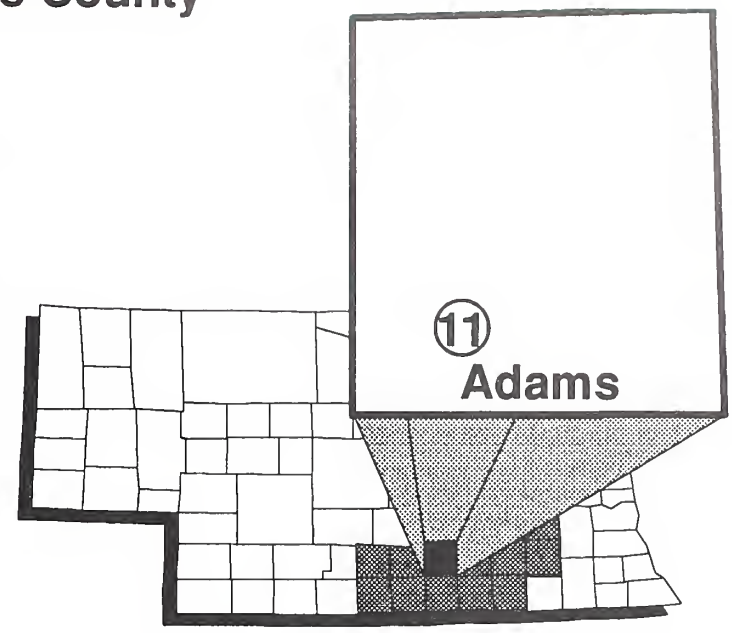
Site 11

Larry Christensen - Adams County

General Information:

Site 11 is located on the Christensen farm five miles south of Holstein in Adams County. A corn/soybean rotation has been the practice on this gravity-irrigated site. The soil type is a Hord silt loam with a 0-1 percent slope.

Larry shredded stalks on April 22, prior to ridge planting Fontanelle 5230, 6340 and 6235 on April 27 in 30-inch rows.



Nitrogen Management

Larry included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2541 feet long and replicated four times. He applied anhydrous ammonia preplant in the bottom of the furrow on April 23. He applied five gallons 10-34-0 in the furrow at planting as a starter fertilizer on April 27.

The recommended rate of nitrogen was determined using a 200-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 200 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 2.2 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.6
OM	1.70%
P	10 ppm
K	315 ppm
Zn	1.27 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	151	201	251
Yield avg. (bu/acre)	143	145	142
Test wt. (lbs/acre)	57	56	56
Moisture (%)	23.2	23.3	23.4

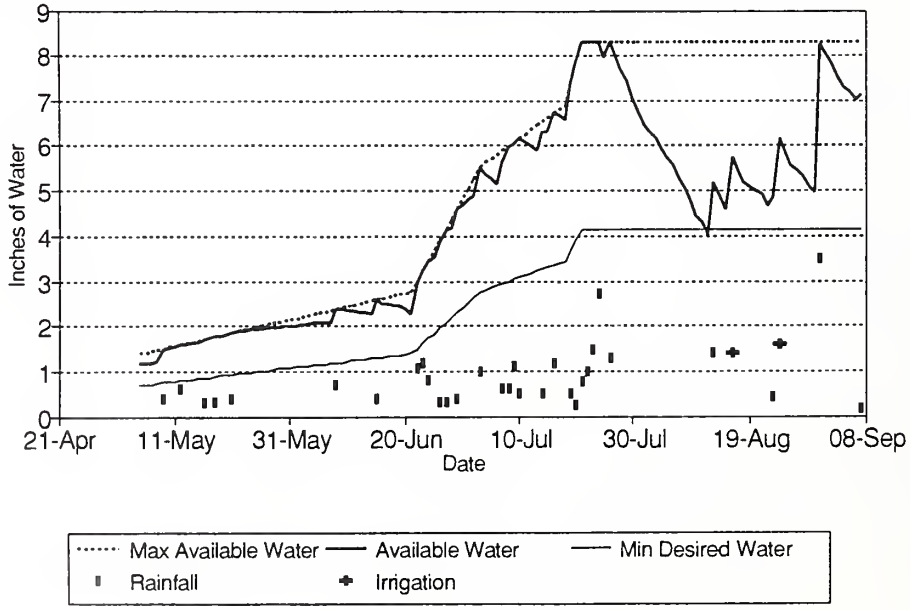
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				85	168		
1991	**Rec**		129	200	135	178		
	50+				185	182		
	-50		30		172	185		
1992	**Rec**	4	28	200	222	195	Avg. N Applied	Avg. Yield
	50+		24		272	197		
	-50		27		151	143	136	165
1993	**Rec**	4	40	200	201	145	186	173
	50+		54		251	142	236	174

Irrigation Management

This site is gravity irrigated, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 24.27 inches of rainfall between May 8 and September 7. and 2.98 inches of water was applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



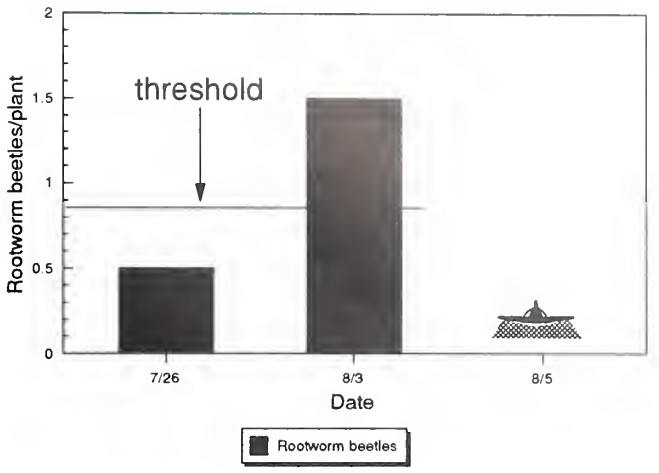
Integrated Pest Management:

Larry cultivated one time and hilled. He applied Bicep II in a band on April 27.

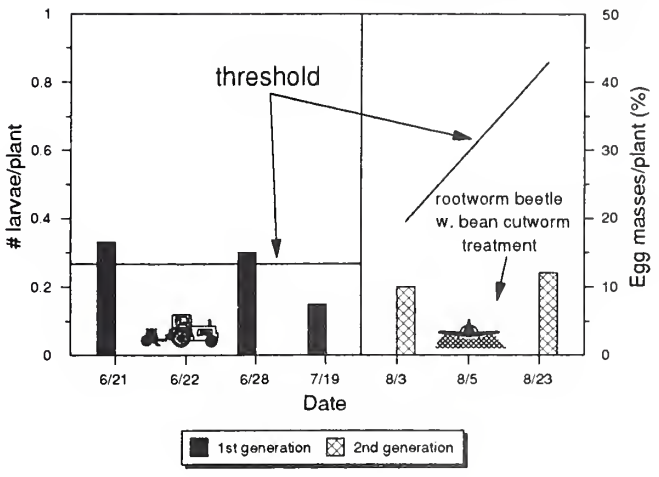
European corn borer exceeded the first generation threshold on June 21 and was treated on June 22 with five pounds of Dipel at hilling. Second generation did not reach the threshold.

Rootworm beetles exceeded the threshold on August 3. Western bean cutworm numbers were also near the threshold. The field was treated with Penncap-M.

Rootworm Management



Corn Borer Management



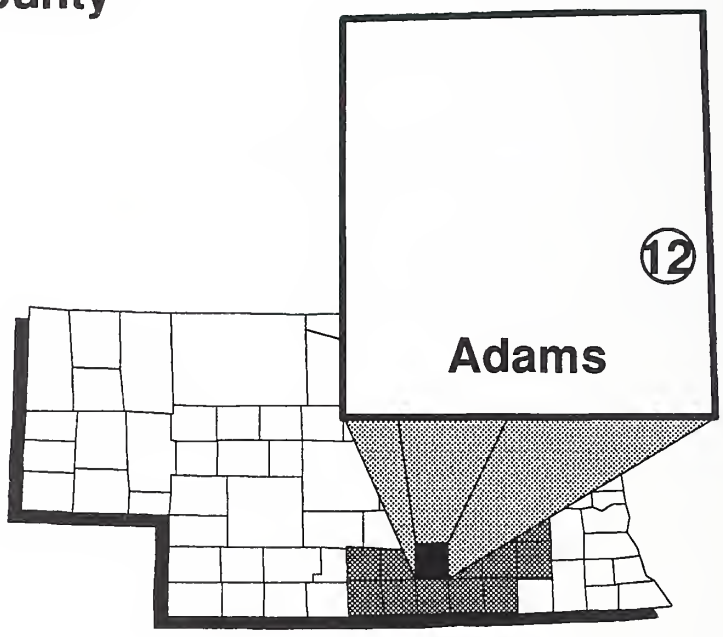
Site 12

Bruce Bohlen - Adams County

General Information:

The Bruce Bohlen farm is the location of Site 12, one mile south of the Muriel Elevator on Showboat Road south of Hastings in Adams County. This pivot-irrigated site has been in continuous seed corn production. The soil type is a Hastings silt loam with a 0-1 percent slope.

Bruce shredded stalks in the fall, prior to planting Pioneer seed corn (code name SEAM) male rows on May 15 and female rows on May 24 in 30-inch rows.



Nitrogen Management

Bruce included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2428 feet long and replicated four times. Bruce applied nitrogen in a split preplant broadcast application using 28-0-0 with four percent sulfur added. At planting, he applied four gallons of 28-0-0, seven gallons 10-34-0 and one quart zinc in a 2X2 placement on May 24.

The recommended rate of nitrogen was determined using an expected yield of approximately 60 to 80 bushels/acre. The rate applied was determined in consultation with Pioneer Hi-Bred, University of Nebraska/SCREC, and Bruce. Seed corn yields are highly variable and this recommendation was consistent with anticipated yield of this inbred. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 7.4 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

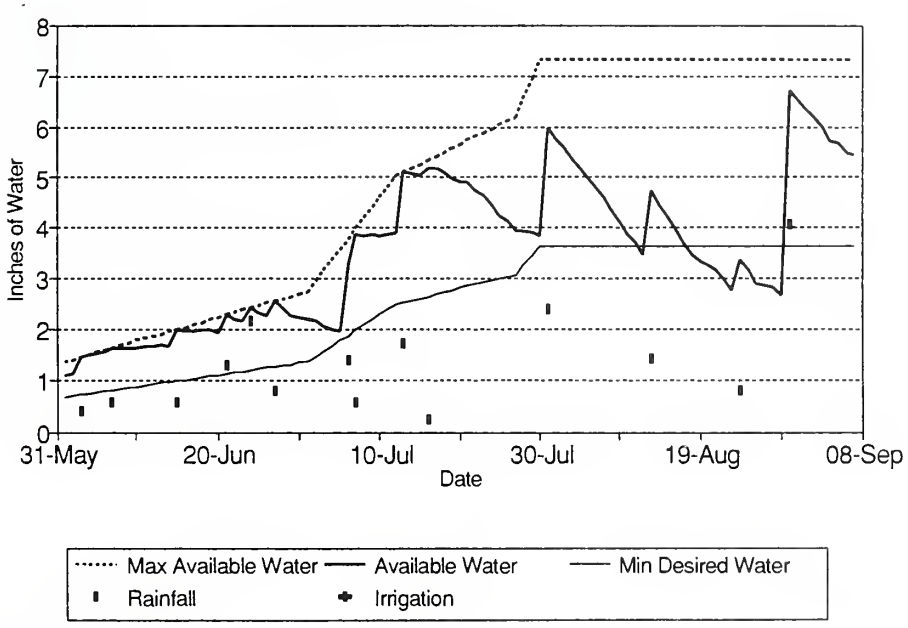
Hybrid seed yields were low in Bruce's area in 1993 due to disease pressure (primarily rust) from cool, wet conditions. Bruce's average yield on this site was 7.3 bushels per acre, which was typical of seed yields in the area. No yield comparisons from individual treatments were obtained.

Irrigation Management

This site is sprinkler irrigated. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 18.65 inches of rainfall between June 1 and September 7. There was no irrigation application applied in 1993.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



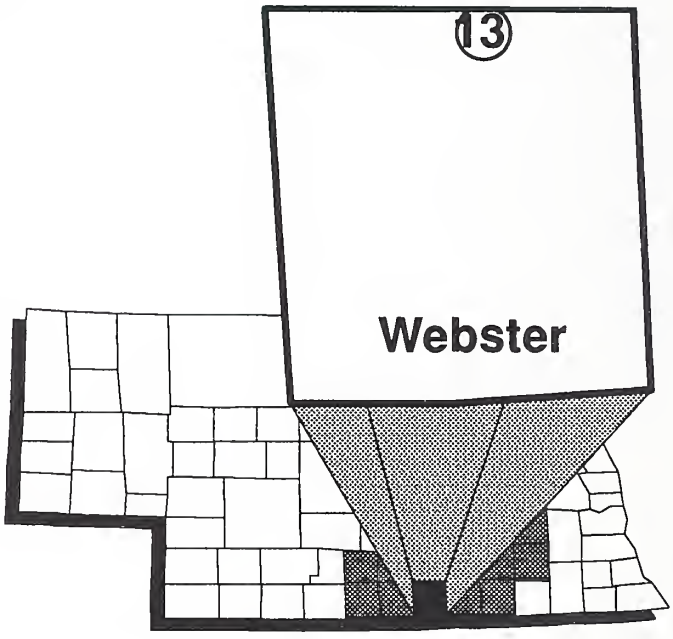
Integrated Pest Management:

Bruce disked this field twice and made a pass with a field cultivator. The field was cultivated for weed control one time. The herbicide program was broadcast on August 20.

Bruce treated the field with eight pounds of Force in a band on male rows May 15 and with the same rate of Force on the female rows on May 24. Penncap-M was applied by air on August 10.

Site 13

Kevin Karr - Webster County



General Information:

Site 13 is located on the Kevin Karr farm $^1/_2$ mile north of Bladen in Webster county. This pivot-irrigated site has been in continuous corn production since 1990. The soil type is a Hastings silt loam with a 0-1 percent slope.

Kevin shredded stalks on April 24, prior to ridge planting Pioneer 3394 on May 17.

Nitrogen Management

Kevin included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1275 feet long and replicated four times. Kevin's field had five percent green snap from the July 8 wind storm. He applied anhydrous ammonia preplant in the bottom of the furrow on April 29. He applied six gallons 10-34-0 with the seed as the starter.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 3.6 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.3
OM	2.40%
P	23 ppm
K	484 ppm
Zn	134 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	110	160	210
Yield avg. (bu/acre)	149	153	154
Test wt. (lbs/acre)	55	54	55
Moisture (%)	21.4	21	21.3

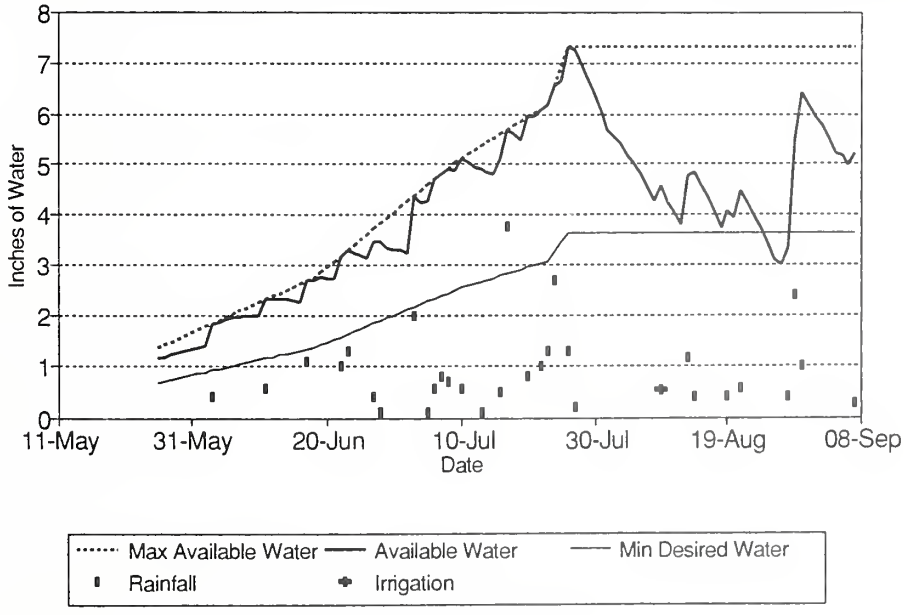
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				92	194		
1991	**Rec**		91	175	142	191		
	50+				192	199		
	-50		123		47	177		
1992	**Rec**	7	129	175	97	194	Avg. N Applied	Avg. Yield
	50+		187		147	196		
	-50		39		110	149	83	173
1993	**Rec**	7	35	175	160	153	133	179
	50+		43		210	154	183	183

Irrigation Management

This site is sprinkler irrigated. Irrigation was scheduled in 1993 using appearance and feel, and the checkbook methods. The field received 28.1 inches of rainfall between May 27 and September 7 and .54 inches of water was applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



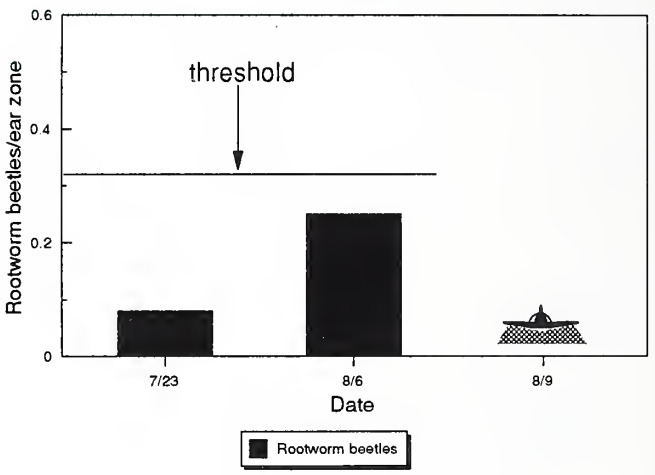
Integrated Pest Management:

Kevin cultivated once. His herbicide program was a broadcast treatment of Marksman on May 19 and Accent broadcast on June 10.

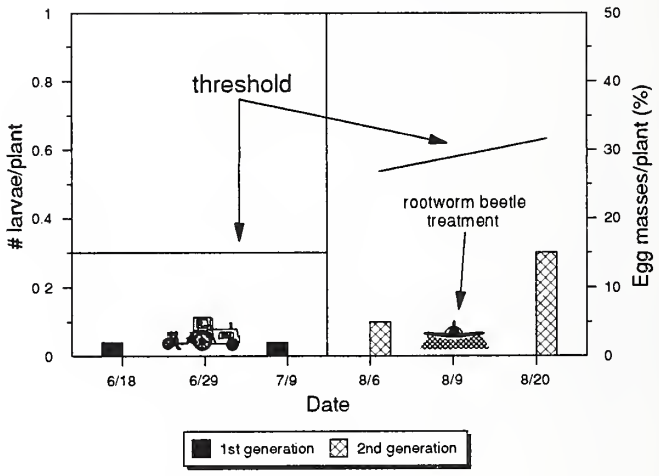
European corn borer did not reach the threshold on this field for either generation. Kevin did chose to treat the field with Dipel on June 29 when he was hilling. This is one of the problems one encounters if ground treatment with the hiller is going to be the method of treatment. In some years, the borer is early enough to make the decision by hilling. In 1993 the populations hadn't reached the threshold by the time Kevin needed to cultivate. Since he used Dipel, a product that is fairly environmentally friendly, his main risk was later infestation that would be missed and perhaps break-even at best on the cost of insecticide.

Rootworm beetles were near the threshold and were treated on August 9.

Rootworm Management



Corn Borer Management



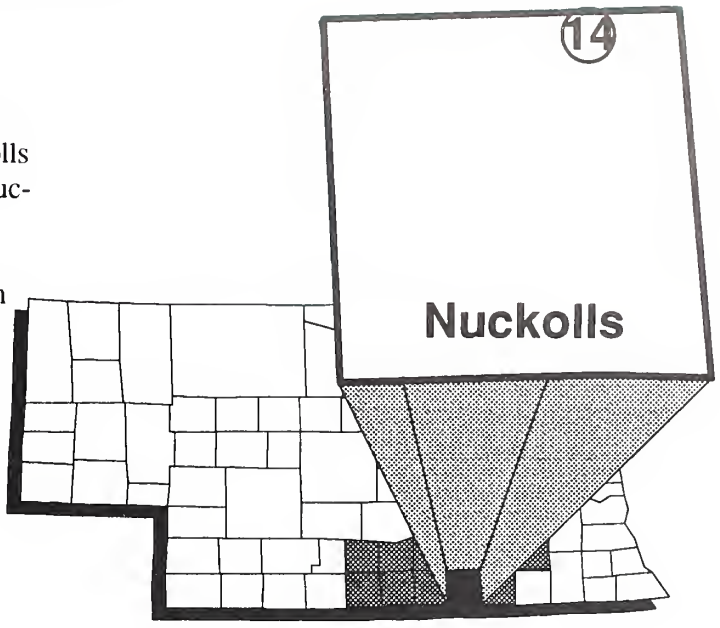
Site 14

Lale Oellerich - Nuckolls County

General Information:

Site 14 is located on the Lale Oellerich farm two miles west and 1/4 mile south of Davenport in Nuckolls County. This field has been in continuous corn production. The soil type is a Crete silt loam with a 0-1 percent slope.

Lale shredded stalks and planted Pioneer 3162 on May 10 and 11 in 36-inch rows.



Nitrogen Management

Lale included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1817 feet long and replicated four times. On May 10 he applied 10-34-0 in the furrow at planting. He sidedress applied anhydrous ammonia on June 7.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 180 bushels of corn. Lale's normal practice is to apply swine slurry manure to $^1/_2$ of the field each year. As a result of the high soil residuals, Lale is currently hauling the manure to other fields. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 3.6 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.2
OM	3.00%
P	86 ppm
K	638 ppm
Zn	1.68 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	86	136	186
Yield avg. (bu/acre)	126	138	123
Test wt. (lbs/acre)	57	57	57
Moisture (%)	20.7	20	20.3

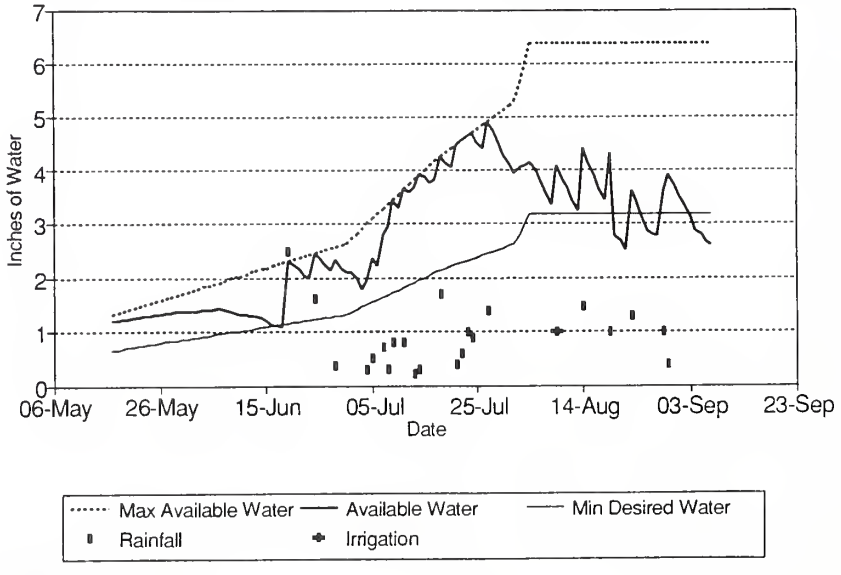
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50							
1990	**Rec**	17	314	180	0	163		
	50+				50	154		
	-50							
1992	**Rec**	17	586	180	0	153	Avg. N Applied	Avg. Yield
	50+		542		50	147		
	-50		51		86	126	86	126
1993	**Rec**	7	57	180	136	138	45	151
	50+		38		186	123	95	141

Irrigation Management

This site is sprinkler irrigated. Irrigation was scheduled in 1993 using the appearance and feel and the check-book methods. The field received 22.83 inches of rainfall between May 17 and September 7. There was one inch of water applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Integrated Pest Management:

Lale cultivated twice for weeds and hilled. He applied Lariat in a band on May 10.

Rootworms were controlled with a banded application of Dyfonate granules. European corn borer was not a problem.

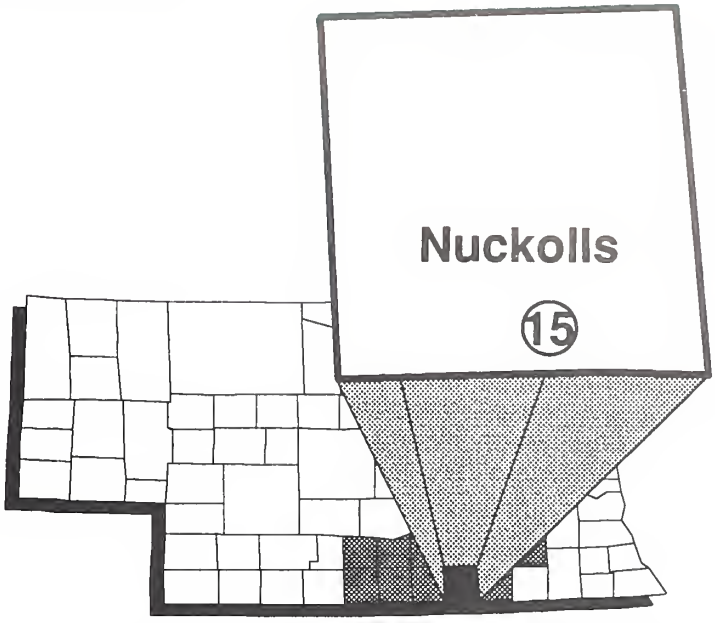
Site 15

Don Kottmeyer - Nuckolls County

General Information:

The Don Kottmeyer farm is the location of site 15, five miles east of Superior in Nuckolls County. This field has been in continuous corn production. The soil type is a Hord silt loam with a 0-1 percent slope.

Don shredded stalks prior to ridge planting Golden Harvest 2530 in 36-inch rows.



Nitrogen Management

Don included nitrogen rate comparison plots in this field. The plots were 10 rows wide, and varied from 618 to 724 feet long and the were replicated four times. Don applied nitrogen using 28-0-0 broadcast with a floater on May 1.

The recommended rate of nitrogen was determined using a 160-bushel yield goal. The rate to be applied was calculated by subtracting soil nitrogen from the nitrogen required for 160 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water was not accounted for because Don irrigates from the canal. Canal water was found to contain less than one ppm nitrate-nitrogen. Irrigation water credit is calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.5
OM	3.00%
P	19
K	421
Zn	0.91

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	90	140	190
Yield avg. (bu/acre)	147	150	156
Test wt. (lbs/acre)	54	55	55
14.8Moisture (%)	15.2	15.2	15.2

Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50		74		80	151		
1990	**Rec**		88	160	130	152		
	50+		41		180	155		
	-50		72		100	152		
1991	**Rec**		62	160	150	156		
	50+		86		200	160		
	-50		91		94	179		
1992	**Rec**		91	160	144	184	Avg. N Applied	Avg. Yield
	50+		93		194	191		
	-50		41		90	147	91	157
1993	**Rec**		36	160	140	150	141	161
	50+		65		190	156	1911	166

Irrigation Management

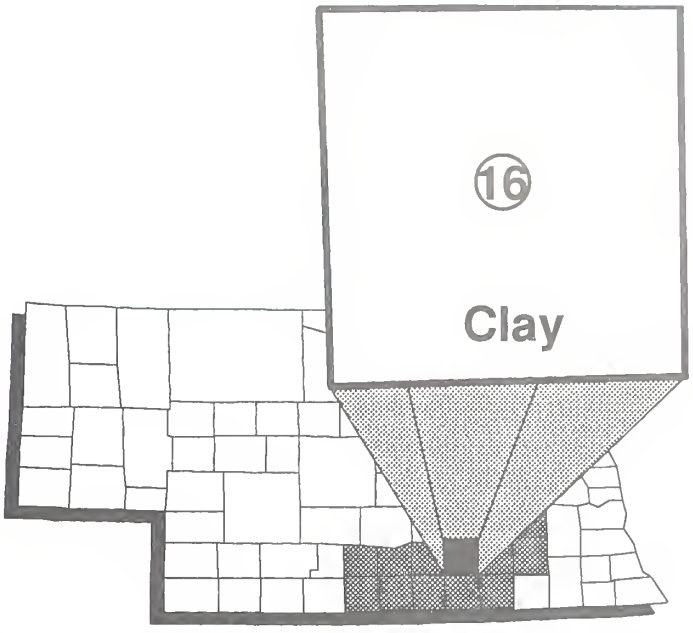
This site is gravity irrigated, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. No irrigation water was applied.

Integrated Pest Management:

Don cultivated once and hilled. He applied Dual plus Aatrex in a band on May 1.
Rootworms were controlled by Dyfonate II applied in a band on May 1.
European corn borer did not reach threshold levels for either generation.

Site 16

Steve Yost - Clay County



General Information:

Site 16 is located on the Steve Yost farm, four miles north and 2 miles west of Clay Center on U.S. Highway 6 in Clay County. This gravity-irrigated farm has a corn/soybean rotation program. This year it was planted to corn. The soil type is a Crete silt loam with a 0-1 percent slope.

Steve ridge planted Golden Harvest H-2525 on May 5 in 30-inch rows, applying a starter fertilizer at planting.

Nitrogen Management

Steve included nitrogen rate comparison plots in this field. The plots were eight rows wide, 2520 feet long and replicated four times. Steve's yields were lower than average this year due to 45 percent green snap from the July 8 wind storm. He split applied, with 40 percent of the required amount at planting and 60 percent applied at cultivation, using 28-0-0 liquid formulation.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 2.8 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	6.2
OM	2.70%
P	9 ppm
K	421 ppm
Zn	1.41 ppm
S	5 ppm

Treatment-1993	Rec	-30	-60	-90
N rate (lbs/acre)	101	71	41	11
Yield avg. (bu/acre)	96	108	102	98
Test wt. (lbs/acre)	55	54	55	55
Moisture (%)	19.8	20.7	20	19.8

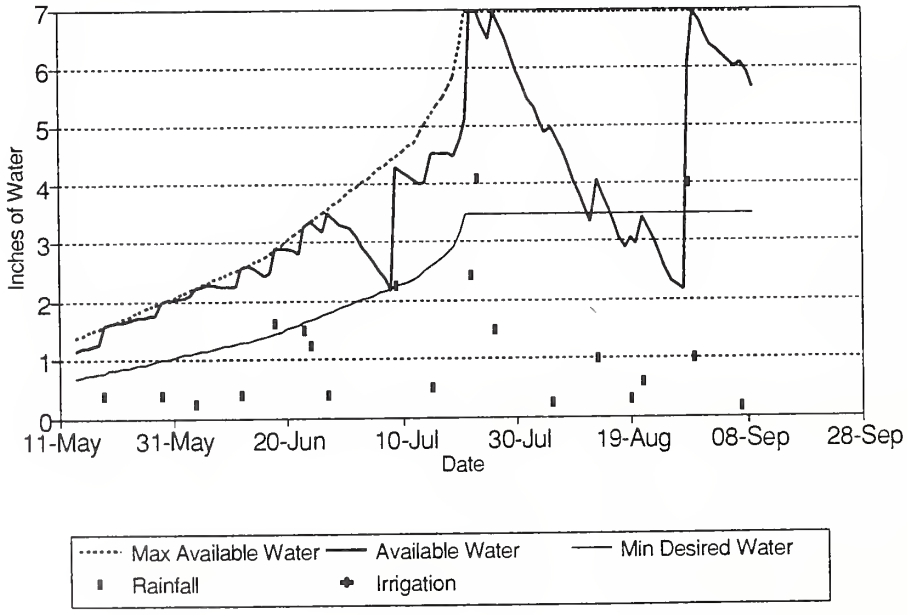
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	2-Year Average	
1992	Rec		23	180	215	177		
	-40				175	170		
	-80				135	171	Avg. N Applied	Avg. Yield
	-120				95	162		
1993	Rec	6	57	180	101	96	158	137
	-40		53		71	108	123	139
	-80		58		41	102	88	137
	-120		51		11	98	53	130

Irrigation Management

This site is pivot irrigated. Irrigation was scheduled in 1993 using the appearance and feel, and the checkbook methods. The field received 24.30 inches of rainfall between May 14 and September 7. Steve did not irrigate this year.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



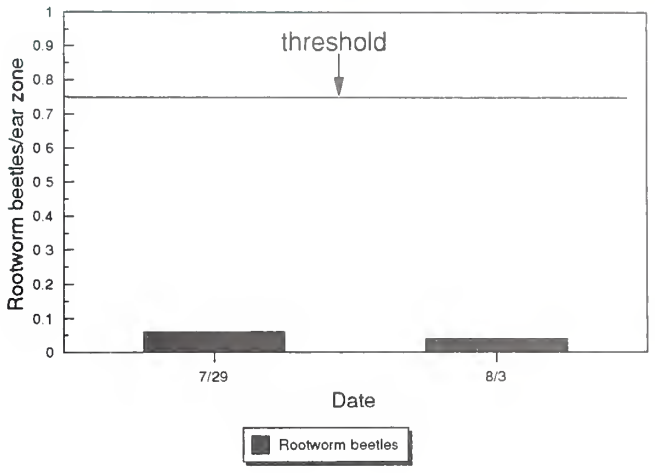
Integrated Pest Management:

Steve cultivated the field one time. He broadcast applied Marksman on May 28 for weed control.

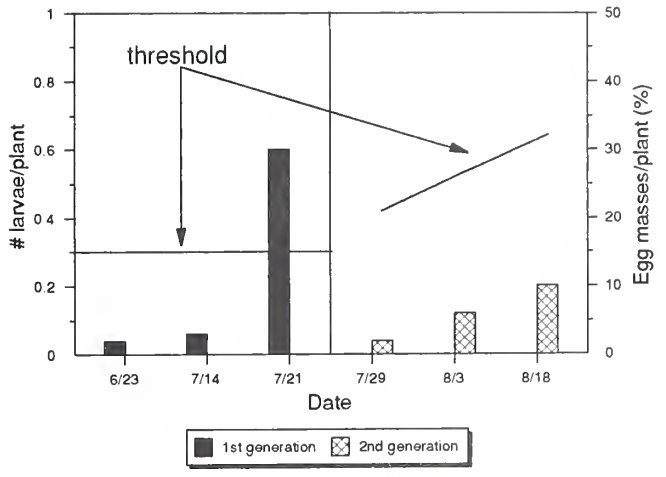
Since Steve rotates crops, he was not concerned about corn rootworm. He used no soil insecticide.

European corn borer exceeded the threshold for first generation on July 21, but control would have been difficult that late in the year, as most larvae were in the stalk by then. No insecticide was used on this field.

Rootworm Management



Corn Borer Management



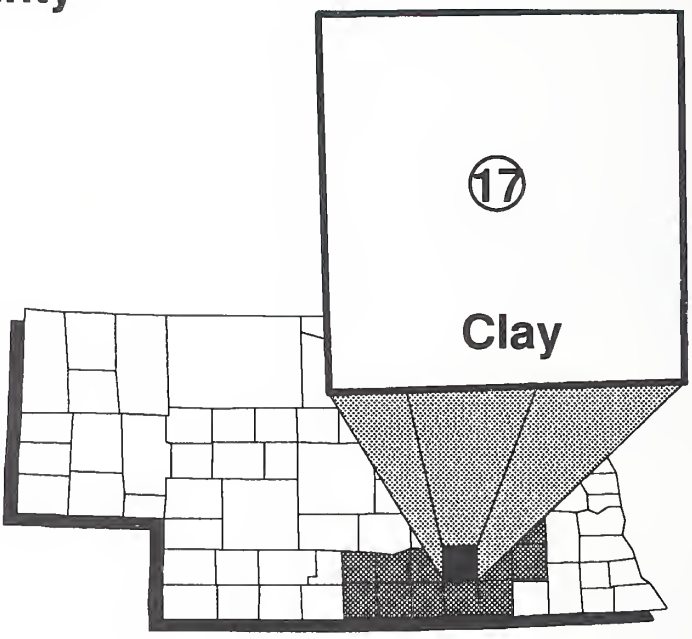
Site 17

Dave Hamburger - Clay County

General Information:

Site 17 is located on the Dave Hamburger farm one mile east of Inland on Highway 6 in Clay County. The soil type is a Crete silt loam with a 0-1 percent slope.

Dave's farm practices included two diskings and a preplant application of NH_3. Dave normally rotates corn and soybeans, but planted corn following corn this year. He planted NC+ 6414 on May 15 in 30-inch rows.



Nitrogen Management

Dave included nitrogen rate comparison plots in this field. The plots were six rows wide, 1584 feet long and replicated four times. Dave's yields were below average this year due to 25 percent green snap from the July 8 wind storm. He split-applied nitrogen , with 36 pounds of nitrogen applied at cultivation using 28-0-0 solution and 119 pounds of nitrogen applied with the hilling operation, using 28-0-0.

The recommended rate of nitrogen was determined using a 190-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 190 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation nitrogen accounted for 6.4 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	6.1
OM	2.80%
P	16 ppm
K	447 ppm
Zn	2.16 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	79	129	179
Yield avg. (bu/acre)	139	136	132
Test wt. (lbs/acre)	51	51	51
Moisture (%)	22.3	22.2	21.6

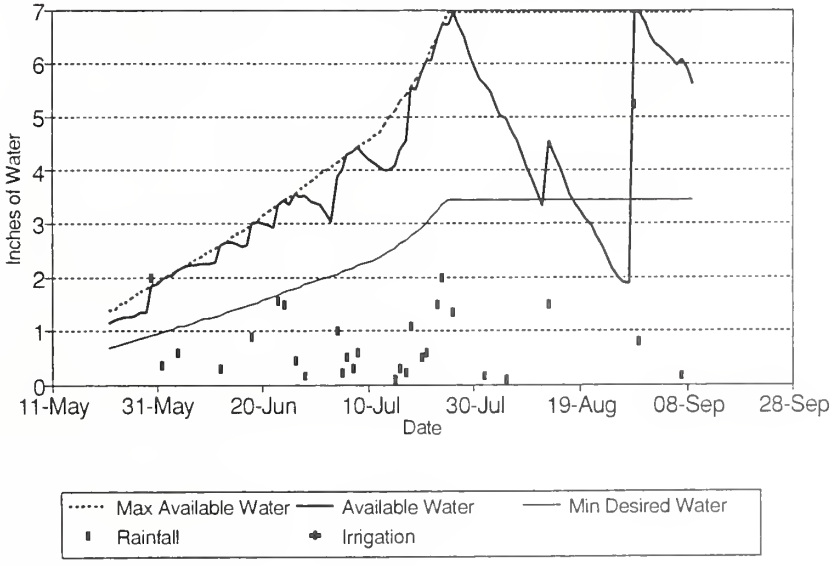
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				65	184		
1991	**Rec**		125	180	115	191		
	50+				165	195		
	-50		38		145	92		
1992	**Rec**	13	44	190	195	90	Avg. N Applied	Avg. Yield
	50+		38		245	88		
	-50		72		79	139	96	138
1993	**Rec**	13	84	190	129	136	146	139
	50+		128		179	132	196	138

Irrigation Management

This site is gravity irrigated, watering alternate (every other) furrows. Irrigation was scheduled in 1993 using the appearance and feel, and the checkbook methods. The field received 26 inches of rainfall between May 25 and September 7. Dave did not irrigate this year.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Integrated Pest Management:

Dave disked the field twice and cultivated once for weeds. He applied Lariat in a band on May 15.

Rootworms had exceeded the threshold level in 1992. Therefore, in 1993, Dave used a soil insecticide for rootworm larvae on May 15. European corn borer were not a problem.

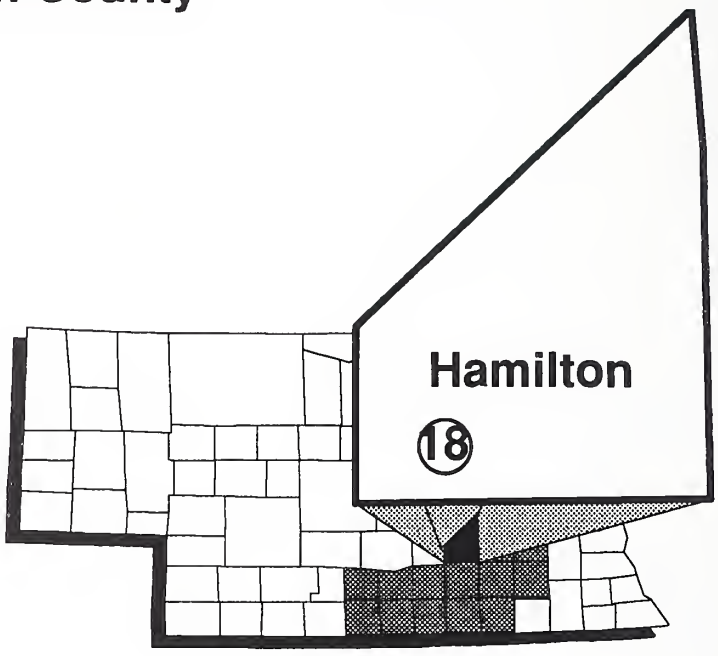
Site 18

Clayton Higgins - Hamilton County

General Information:

The Clayton Higgins farm is the location of Site 18, 1/2 mile west of Giltner in Hamilton County. This field had been in continuous corn production. The soil type is a Hastings silt loam with a 0-1 percent slope.

Clayton rotated this plot to soybeans in 1993.



Integrated Pest Management:

Clayton will rotate back to corn in 1994 and will not need to treat for rootworm.

Clayton scouts his own fields. He generally uses the rootworm beetle control program.

General Fertility	
pH	6.4
OM	3.20%
P	21 ppm
K	441 ppm
Zn	1.74 ppm

Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	2-Year Average	
	-50 NH3				58	152		
	-50 LIQ				58	154		
1991	**Rec**		132	180	108	168	Avg. N Applied	Avg. Yield
	Rec LIQ				108	169		
	50+ NH3				158	167		
	-50NH3				150	151	104	152
	-50 LIQ				150	143	104	149
1992	**Rec NH3**				200	157	154	163
	Rec LIQ				200	152	154	161
	50+ NH3				250	152	204	160
1993		soybeans were planted in the plot area in 1993						

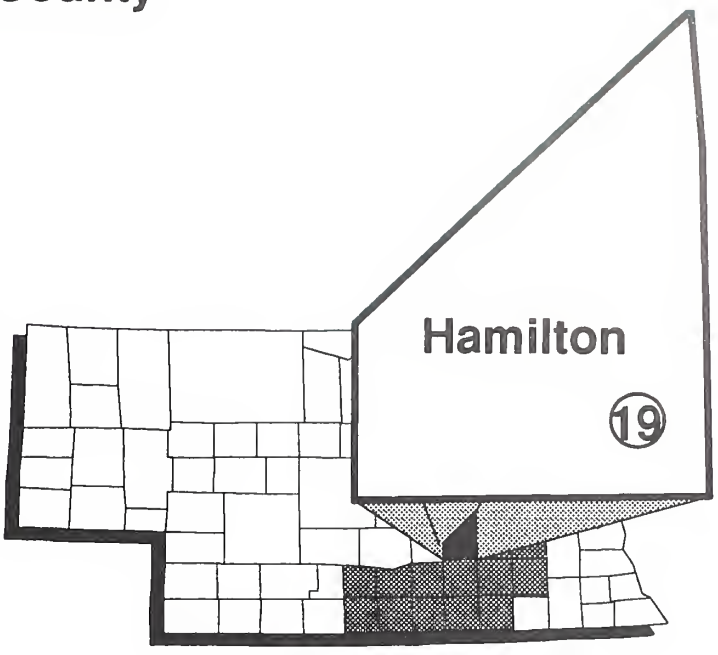
Site 19

Carey Friesen - Hamilton County

General Information:

Site 19 is located on the Carey Friesen farm $1^1/_2$ miles south of the I-80 Hampton exit in Hamilton county. This field is in continuous corn production. The soil type is a Crete silt loam with a 0-1 percent slope.

Carey disked/planted Pioneer 3162 on April 30 in 30-inch rows.



Nitrogen Management

Carey included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1462 feet long, and replicated four times. He applied the entire amount of nitrogen as anhydrous in a preplant application.

The recommended rate of nitrogen was determined using a 190-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 190 bushels of corn. The soil nitrate was measured in three-feet deep soil samples. The irrigation nitrogen accounted for 8.6 ppm nitrate nitrogen in samples drawn in 1993. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	6.2
OM	2.90%
P	15 ppm
K	431 ppm
Zn	.54 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	65	155	165
Yield avg. (bu/acre)	114	117	123
Test wt. (lbs/acre)	53	53	53
Moisture (%)	21.9	22.2	22.1

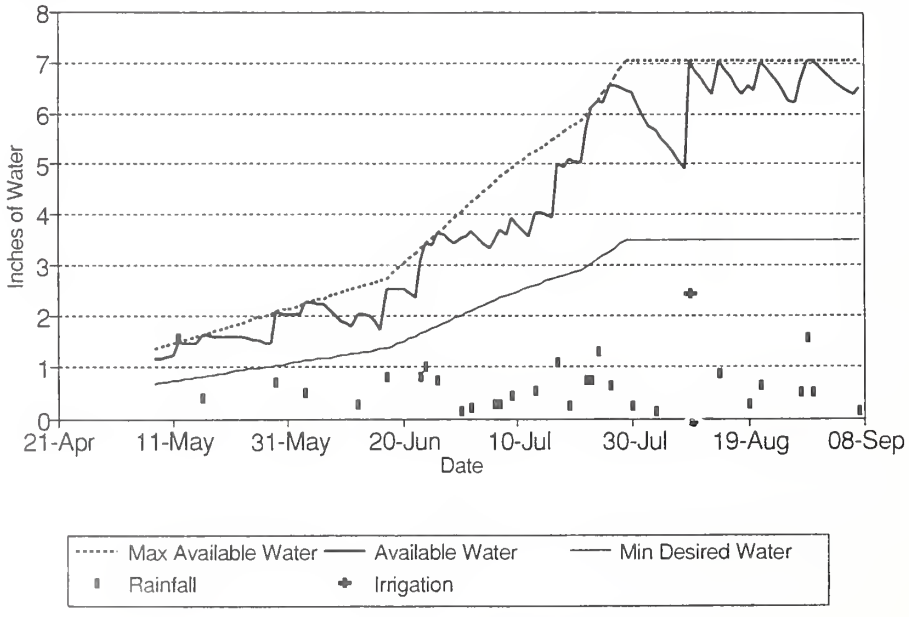
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				115	170		
1991	**Rec**		85	190	165	175		
	50+				215	179		
	-50		85		67	129		
1992	**Rec**	15	120	190	117	145	Avg. N	Avg.
	50+		129		167	164	Applied	Yield
	-50				65	114	82	138
1993	**Rec**	15	75	190	115	117	132	146
	50+				165	123	182	155

Irrigation Management

This site is gravity irrigated, watering every row. Irrigation was scheduled in 1993 based on the appearance and feel and the checkbook methods. The field received 19.70 inches of rainfall between May 8 and September 7 and 2.44 inches of water was applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



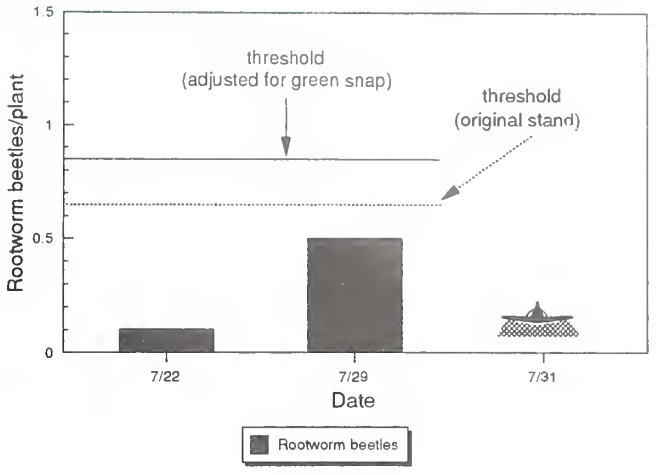
Integrated Pest Management:

Carey disked this field twice except for the area where nitrogen plots were established. He cultivated once and hilled. He applied Lariat plus atrazine in a band on April 30.

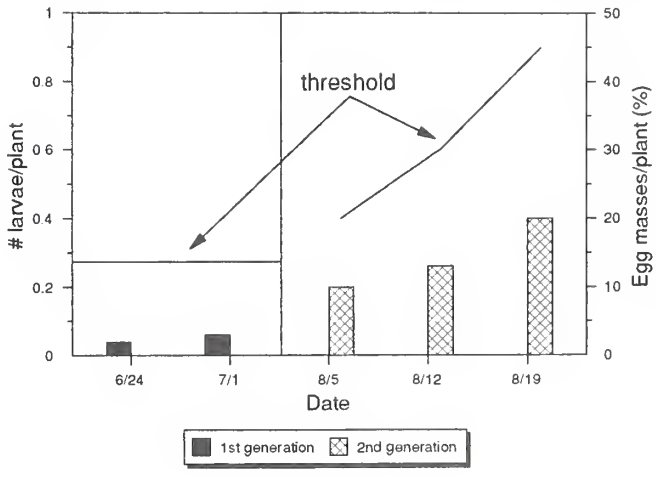
Rootworm beetles neared the threshold, based on the original stand and he treated with Penncap-M on July 31. The field would not have reached threshold based on remaining stand, but the patchy nature of wind damage made this a difficult decision.

European corn borer did not reach the threshold for either generation.

Rootworm Management



Corn Borer Management



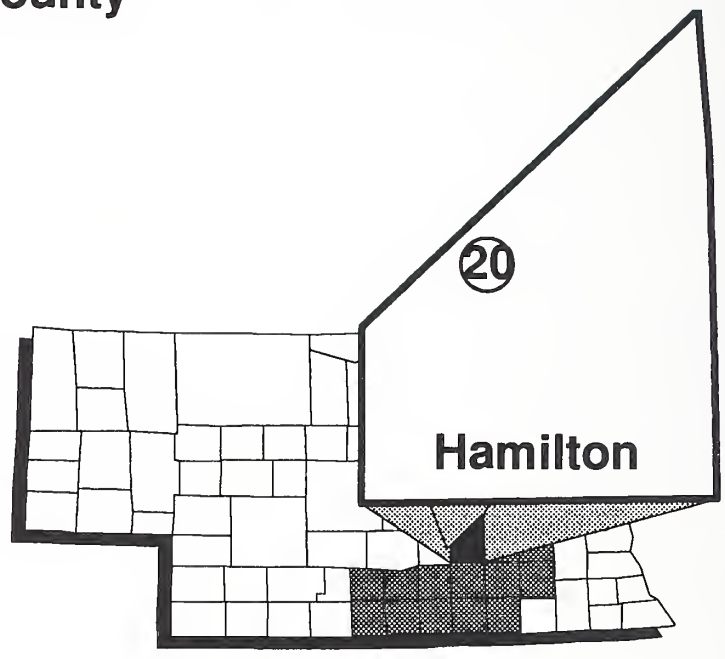
Site 20

Curt Carlson - Hamilton County

General Information:

Site 20 is located 5 1/2 miles north of the Murphy in Hamilton County on the Curt Carlson farm. This field is in continuous corn production. The soil type is a Holder silt loam with a 0-1 percent slope.

Curt shredded stalks in April 5 and ridge planted Pioneer 3417 in 30-inch rows.



Nitrogen Management

Curt included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1636 feet long and replicated four times. Curt's yields are below average this year. He suffered 20 percent green snap from wind damage. Curt applied the entire amount of nitrogen as anhydrous ammonia in a preplant application April 15.

The recommended rate of nitrogen was determined using a 215-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 215 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	6.4
OM	2.90%
P	26 ppm
K	389 ppm
Zn	1.82 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	176	176	226
Yield avg. (bu/acre)	137	138	141
Test wt. (lbs/acre)	54	54	54
Moisture (%)	17	17	17.1

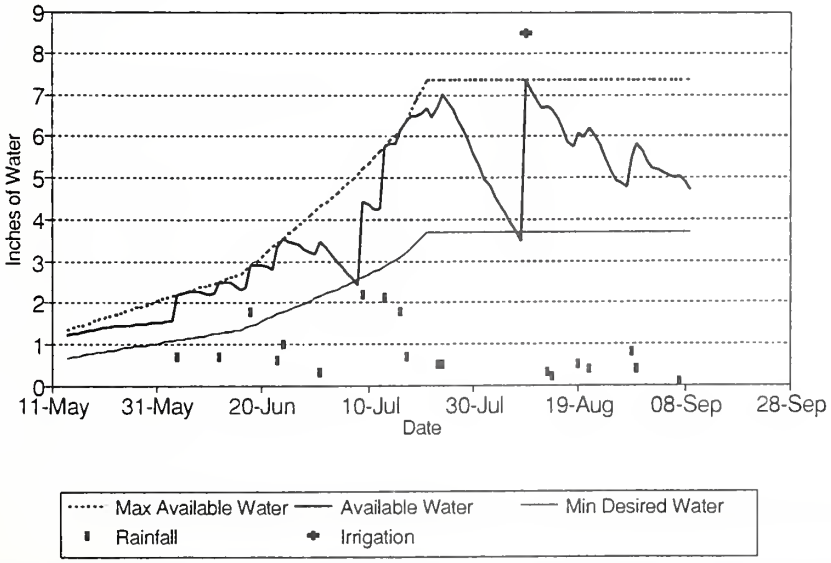
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50		25		168	204		
1990	**Rec**	10	36	200	218	204		
	50+		45		268	206		
	-100		37		121	208		
1991	-50		28		171	213		
	Rec	16	49	200	221	215		
	-50		116		62	173		
1992	**Rec**	14	116	200	112	197	Avg. N Applied	Avg. Yield
	50+		139		162	206		
	Prior low		51		176	137	144	182
1993	**Rec**	14	28	215	176	138	182	189
	50+		29		226	141	219	184

Irrigation Management

This site is gravity irrigated, watering alternate (every other) furrows. Curt used a surge valve and diked the rows at the lower end. Irrigation was scheduled in 1993 based on the appearance and feel and the check book method. The field received 15.60 inches of rainfall between May 14 and September 7 and 8.49 inches of water was applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.

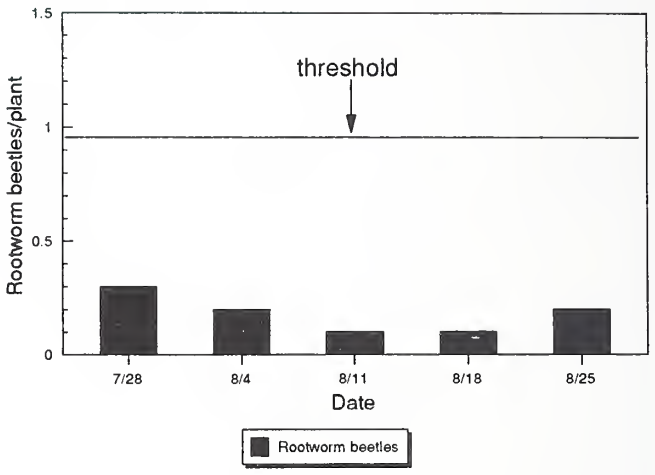


Integrated Pest Management:

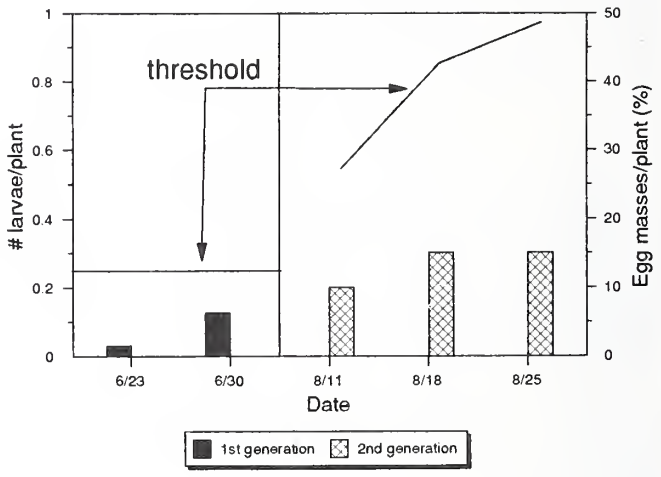
Curt used the rootworm beetle control program, so he applied no soil insecticide. Rootworm beetle numbers did not reach the threshold and he did not treat.

European corn borer did not reach the threshold for either generation.

Rootworm Management



Corn Borer Management



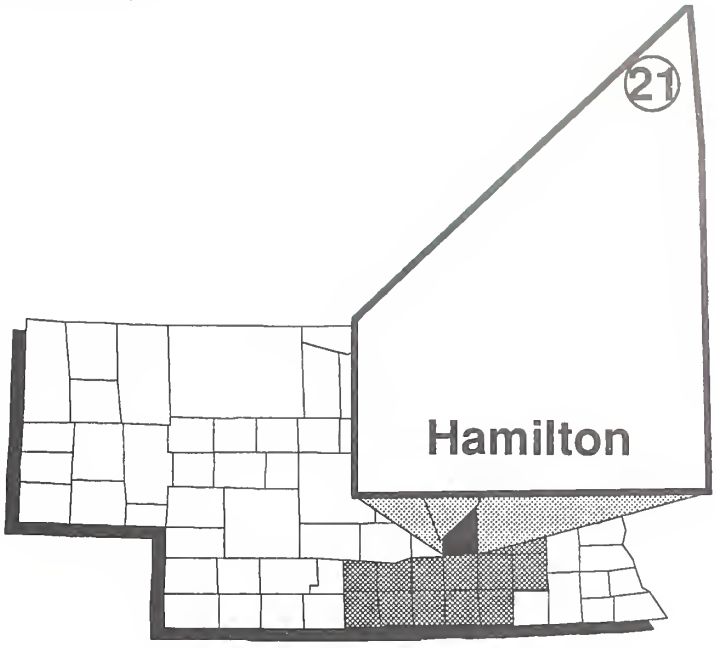
Site 21

Joel Anderson - Hamilton County

General Information:

Site 21 is located on the Joel Anderson farm three miles east and two miles south of Hordville in Hamilton county. The soil type is a Holder silt loam with a 0-1 percent slope.

Joel shredded stalks on April 15 and followed with planting Pioneer 3379 on April 29 in 36-inch rows.



Nitrogen Management

Joel included nitrogen rate comparison plots in this field. The plots were six rows wide, 2662 feet long and replicated four times. He applied 15 pounds of nitrogen in a band at planting, in a 28-0-0 liquid formulation and he applied the rest of the nitrogen in a sidedress application using anhydrous ammonia.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in three-feet deep soil samples. Irrigation water credit was calculated by multiplying the ppm nitrate by two. The irrigation nitrogen accounted for 9.5 ppm nitrate nitrogen in samples drawn in 1993. Irrigation water credit is calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.3
OM	2.80%
P	23 ppm
K	475 ppm
Zn	2.13 ppm

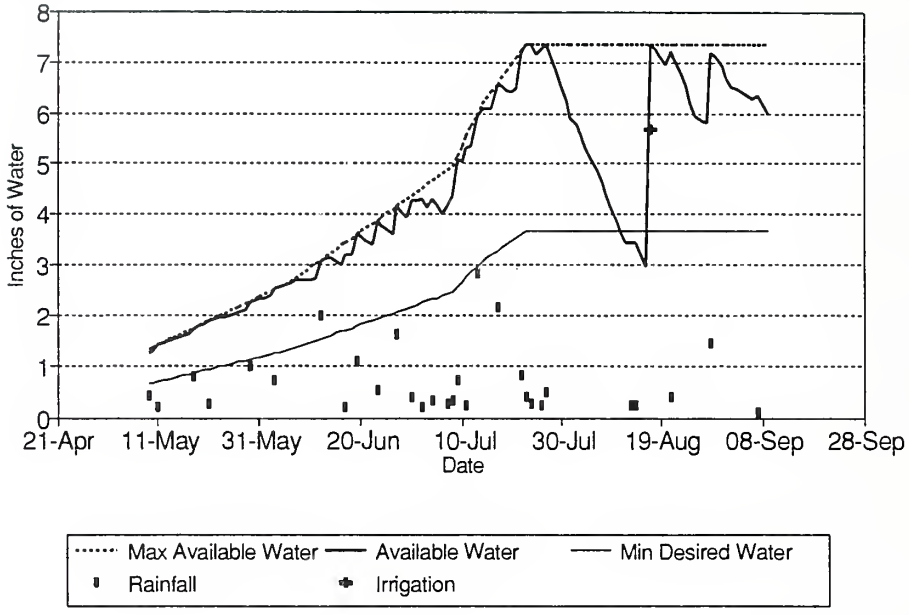
Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	82	123	182
Yield avg. (bu/acre)	103	118	120
Test wt. (lbs/acre)	54	55	55
Moisture (%)	15.5	15.5	15.5

Irrigation Management

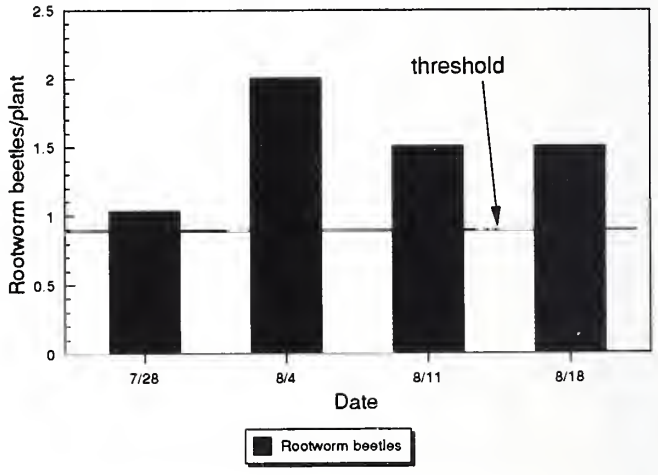
This site is gravity irrigated, watering every row. Irrigation was scheduled in 1993 based on the appearance and feel and the checkbook method. The field received 20.95 inches of rainfall between May 9 and September 7 and 5.67 inches of water were applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Rootworm Management



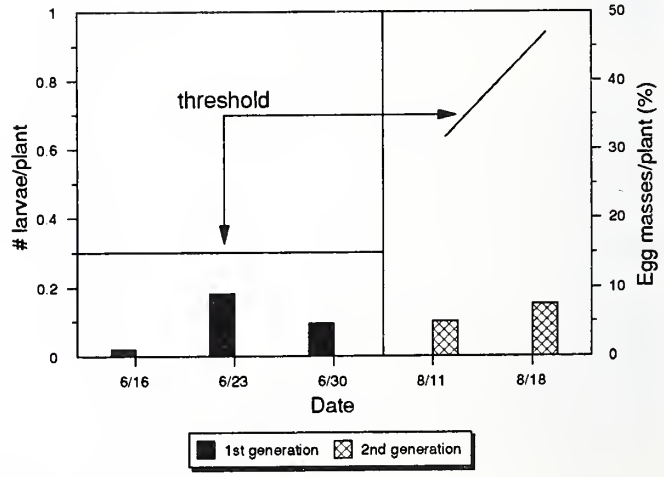
Integrated Pest Management:

Joel cultivated once and hilled. He banded atrazine plus 2,4-D at planting on April 27.

Joel had rootworm beetles exceed the threshold in 1992, so he applied a soil treatment of Dyfonate II at planting for larvae control. The threshold was again exceeded throughout August 1993, so he will need a soil treatment in 1994 if he plants corn.

European corn borer did not reach the threshold for either generation.

Corn Borer Management



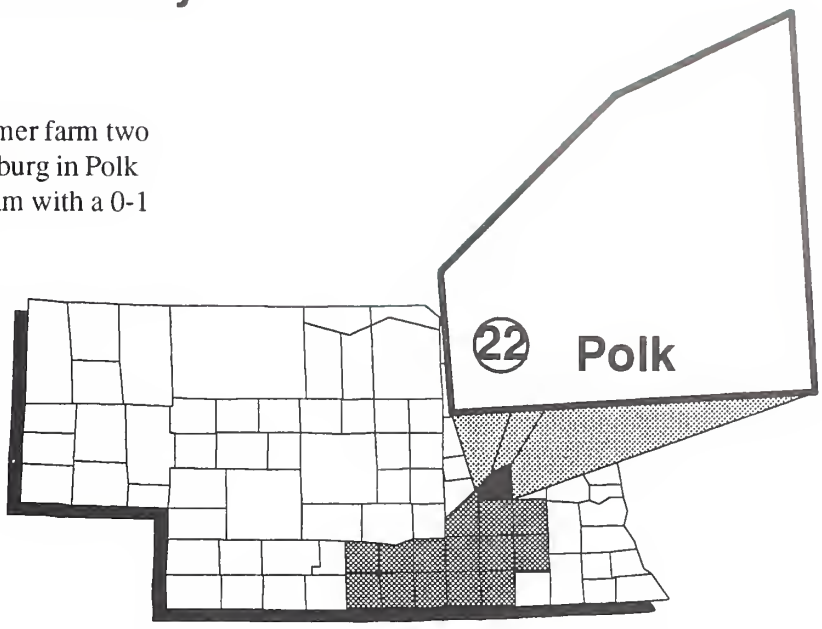
Site 22

Mark Newcomer - Polk County

General Information:

Site 22 is located on the Mark Newcomer farm two miles south and three miles east of Stromsburg in Polk county. The soil type is a Hastings silt loam with a 0-1 percent slope.

Mark shredded stalks on April 15 before ridge planting 36-inch rows of Pioneer 3162 on April 26.



Nitrogen Management

Mark included nitrogen rate comparison plots in this field. The plots were 14 rows wide, of varied length, and replicated four times. He applied the entire amount of nitrogen as anhydrous ammonia in a sidedress application on May 15, except for six pounds, which he applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1991 recommended rate strips. The irrigation nitrogen accounted for 5.6 ppm nitrate nitrogen in samples drawn in 1993. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	6.3
OM	2.60%
P	19 ppm
K	375 ppm
Zn	.79 ppm

Treatment-1993	-50	Rec	+30
N rate (lbs/acre)	38	88	118
Yield avg. (bu/acre)	149	145	150
Test wt. (lbs/acre)	54	54	54
Moisture (%)	20.7	21.3	20.9

Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)
	-50				145	185
1990	**Rec**	9	29	175	195	185
	30+				225	185
	-50		40		135	160
1991	**Rec**	3	43	175	185	157
	30+		46		215	159
	-50		127		62	197
1992	**Rec**	12	99	175	112	190
	30+		99		142	199
	-50		62		38	149
1993	**Rec**	12	66	175	88	145
	30+		58		118	150

Irrigation Management

This site is gravity irrigated, watering alternate (every other) furrows. Mark used a surge valve. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook method. Mark applied 1.73 inches of water in 1 irrigation.

Integrated Pest Management:

Mark planted corn following beans this year. He cultivated the field once and hilled. He applied Extrazine II in a band on April 26. No insecticides were used on this field.

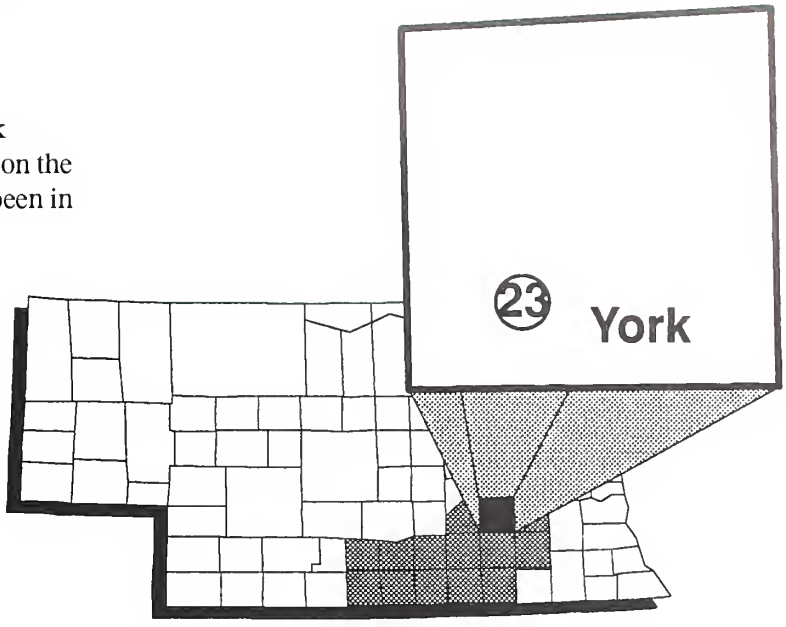
Site 23

Jerry Stahr - York County

General Information:

Site 23 is located three miles east of the York junction of Highways 81 and 34 in York County on the Jerry Stahr farm. This pivot-irrigated farm has been in continuous corn production. The soil type is a Hastings silt loam with a 0-1 percent slope.

Jerry shredded stalks on April 15 prior to ridge planting Golden Harvest H-2493 on April 29 in 30-inch rows.



Nitrogen Management

Jerry included nitrogen rate comparison plots in this field. The plots were eight rows wide, varied row length, and replicated four times. Jerry's yields reflected the effect of 45 percent stalk breakage from the July 8 wind storm. He applied the entire amount of nitrogen as anhydrous ammonia on June 15, except for five pounds which he applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 185-bushel expected yield. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 185 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips.

General Fertility	
pH	6.6
OM	2.70%
P	27 ppm
K	342 ppm
Zn	1.04 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	116	166	216
Yield avg. (bu/acre)	106	110	110
Test wt. (lbs/acre)	52	52	52
Moisture (%)	18.5	18.7	18.4

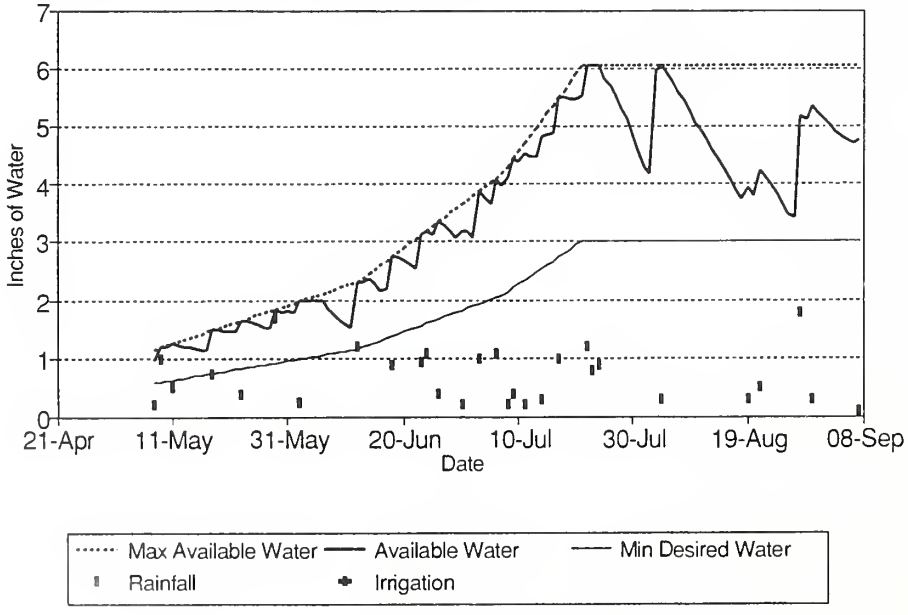
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				105	190		
1991	**Rec**		88	185	155	193		
	50+				205	197		
	-50		14		165	176		
1992	**Rec**	10	19	185	215	175	Avg. N	Avg.
	50+		21		265	174	Applied	Yield
	-50		34		116	106	129	157
1993	**Rec**		37	185	166	110	179	159
	50+		36		216	110	229	160

Irrigation Management

This site is pivot irrigated. Irrigation was scheduled in 1993 using soil moisture blocks and the checkbook method. The field received 19.95 inches of rainfall between May 8 and September 7 and Jerry did not irrigate this field this year.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



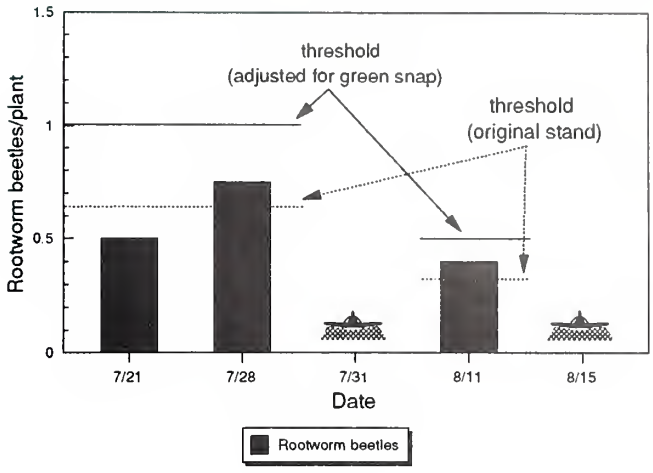
Integrated Pest Management:

Jerry cultivated this field twice. Bicep II was applied in a band on April 29.

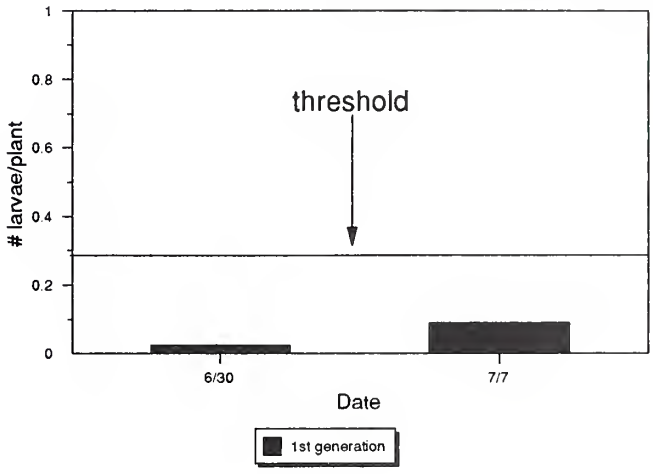
Jerry used the rootworm beetle control program. The threshold was not exceeded based on stands after the wind storm. It was exceeded based on original stand and was treated with Penncap-M on July 31. The numbers of beetles rose above the retreatment threshold, based on original stand, and he treated a second time on August 15. The general recommendation was to use existing stands. However, the patchy nature of the wind damage made this decision difficult.

European corn borer did not reach the threshold for either generation. The second generation was probably held down by the rootworm beetle treatments.

Rootworm Management



Corn Borer Management



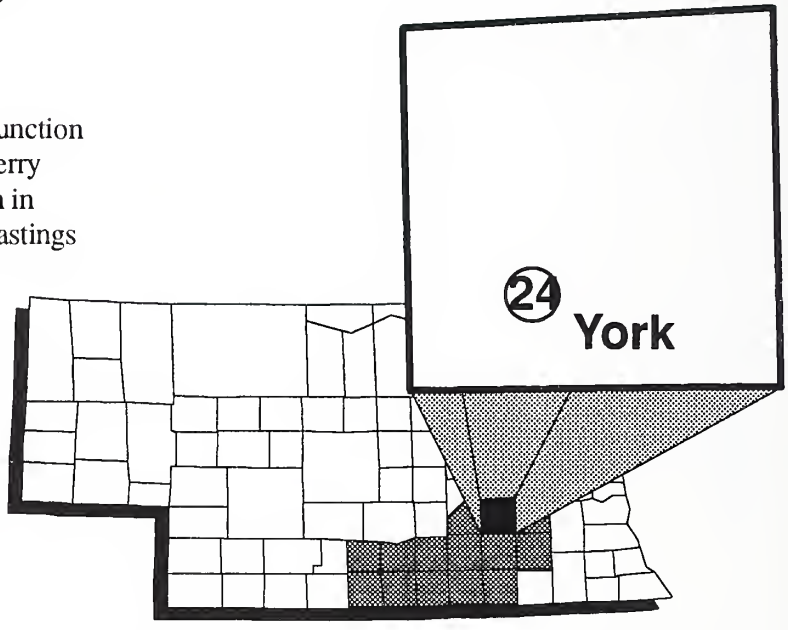
Site 24

Jerry Stahr - York County

General Information:

Site 24 is located one mile east of the York junction of Highways 81 and 34 in York County on the Jerry Stahr farm. This gravity-irrigated farm has been in continuous corn production. The soil type is a Hastings silt loam with a 0-1 percent slope.

Jerry shredded stalks on April 15 prior to ridge planting Golden Harvest H-2493 on May 12 in 30-inch rows.



Nitrogen Management

Jerry included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1244 feet long, and replicated four times. Jerry's yields reflected the effect of 15 percent green snap from the July 8 wind storm. He applied the entire amount of nitrogen as anhydrous ammonia on June 17, except for five pounds which he applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 185-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 185 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation nitrogen accounted for 9.7 ppm nitrate nitrogen in samples drawn in 1993. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	6.4
OM	2.70%
P	16 ppm
K	357 ppm
Zn	.69 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	104	154	204
Yield avg. (bu/acre)	139	146	147
Test wt. (lbs/acre)	53	53	53
Moisture (%)	18.6	18.4	18.3

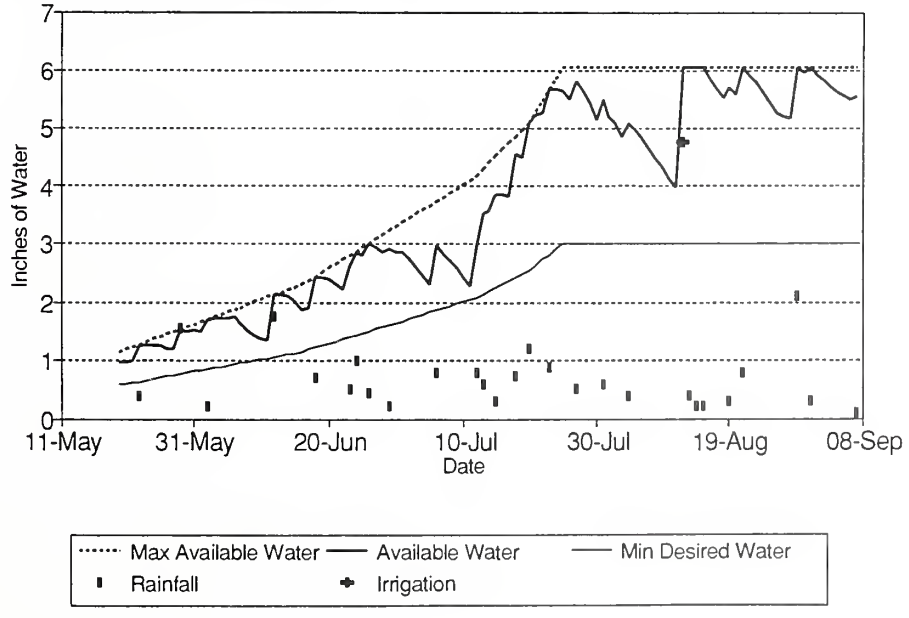
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				101	168		
1991	**Rec**		102	185	151	181		
	50+				201	182		
	-50		18		157	173		
1992	**Rec**	10	21	185	207	174	Avg. N Applied	Avg. Yield
	50+		30		257	173		
	-50		38		104	139	121	160
1993	**Rec**	10	41	185	154	146	171	167
	50+		47		204	147	221	167

Irrigation Management

This site is gravity irrigated, watering every row. Jerry used a surge valve. Irrigation was scheduled in 1993 using soil moisture blocks and the checkbook method. The field received 18.00 inches of rainfall between May 17 and September 7 and 4.75 inches of water was applied in 1 irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



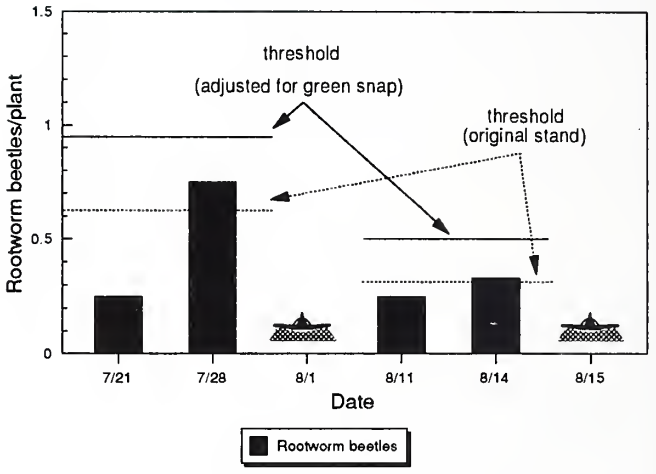
Integrated Pest Management:

Jerry cultivated this field and hilled. Bicep II was applied in a band on May 2. He broadcast Beacon on June 21.

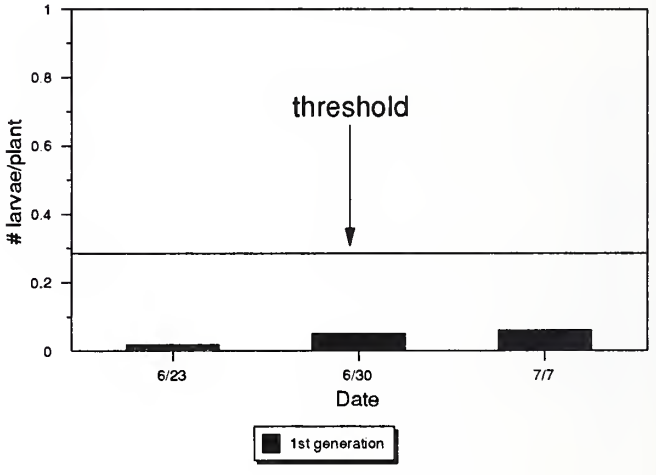
Jerry used the rootworm beetle control program. The threshold was not exceeded based on stands after the wind storm. It was exceeded based on original stand and was treated with Penncap-M on August 1. The numbers of beetles rose above the retreatment threshold, based on original stand, and Jerry treated a second time on August 15. The general recommendation was to use existing stands. However, the patchy nature of the wind damage made this decision difficult.

European corn borer did not reach the threshold for either generation. The second generation was probably held down by the rootworm beetle treatments.

Rootworm Management



Corn Borer Management



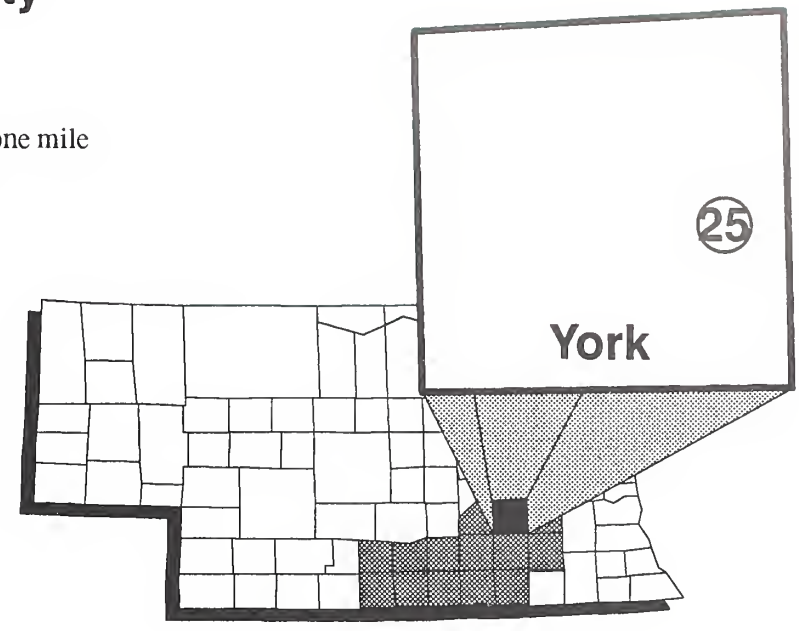
Site 25

Brad Rathje - York County

General Information:

Site 25 is located on the Brad Rathje farm one mile west of Waco in York County. This soil type is a Hastings silt loam with a 0-1 percent slope.

Brad ridge planted Ciba Seeds 4513 on May 16 in 30-inch rows.



Nitrogen Management

Brad included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1000 feet long and replicated four times. Brad's yields reflected the effect of 30 percent green snap from the July 8 wind storm. He applied 90 pounds of nitrogen, using 28-0-0 liquid in one cultivation application June 21 and he applied eight pounds with the seed in the form of a 10-34-0 liquid starter. Because of the wet season, this is all the nitrogen Brad could apply.

The recommended rate of nitrogen was determined using a 200-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 200 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation nitrogen accounted for 0.9 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and it is based on a yearly application of nine inches of water.

General Fertility	
pH	6
OM	2.90%
P	13 ppm
K	263 ppm
Zn	.97 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	98	98	98
Yield avg. (bu/acre)	96	97	99
Test wt. (lbs/acre)	52	52	52
Moisture (%)	21.6	22.1	22

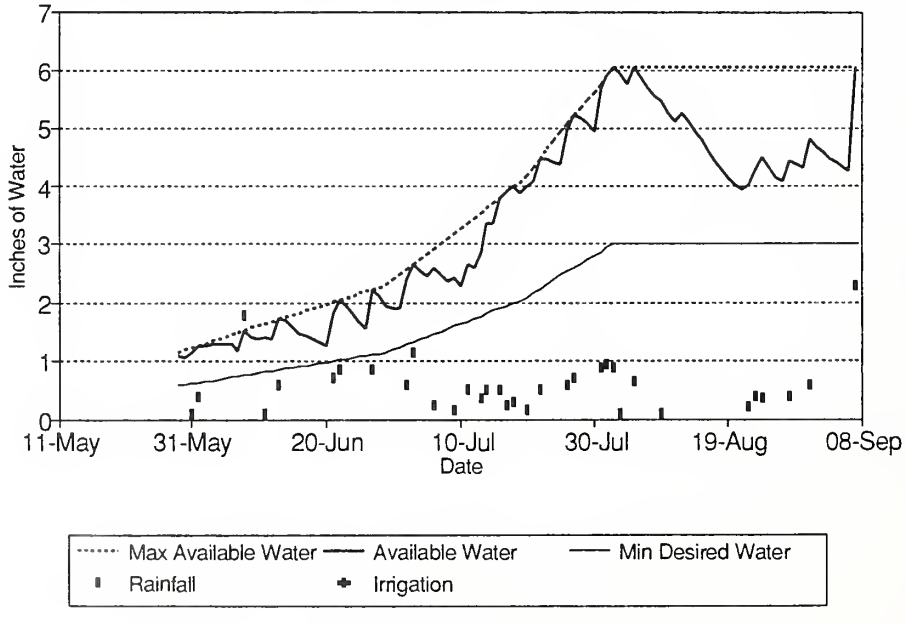
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	4-Year Average	
	-50				135	190		
1990	**Rec**		43	173	185	192		
	50+				235	195		
	-50	3	31		120	169		
1991	**Rec**		52	170	170	171		
	50+		38		220	173		
	-50	2	19		118	187		
1992	**Rec**		39	170	168	184	Avg. N	Avg.
	50+		83		218	188	Applied	Yield
	-50		30		98	96	118	161
1993	**Rec**	2	30	200	98	97	155	161
	50+		30		98	99	193	164

Irrigation Management

This site is gravity irrigated, watering every furrow. Brad used a surge valve. Irrigation was scheduled in 1993 using soil moisture blocks and the checkbook method. The field received 19.95 inches of rainfall between May 29 and September 7. Brad did not irrigate this year.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



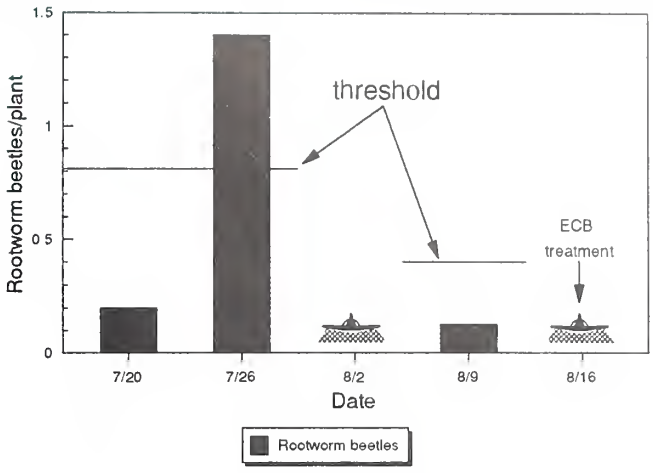
Integrated Pest Management:

Brad cultivated and hilled. He applied a preplant application of Lasso on May 16. He applied Marksman, broadcast, on June 4.

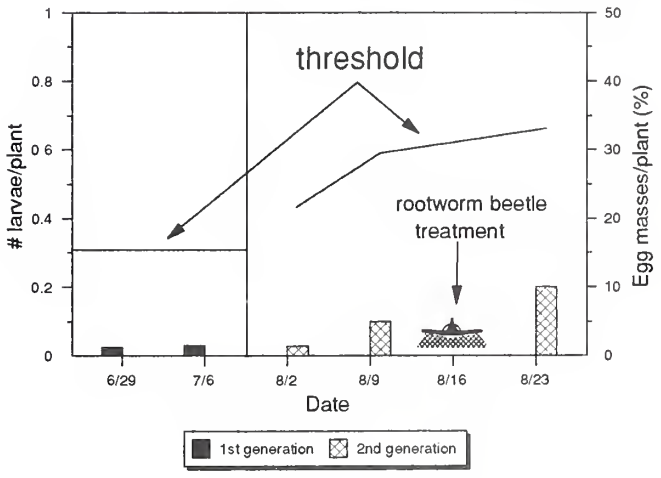
Rootworm beetles exceeded the threshold on July 26 and Brad treated with Penncap-M on August 2. He had low levels of western bean cutworm, European corn borer and rootworm beetles after the treatment and he chose to treat again on August 16.

European corn borer did not exceed the threshold for either generation.

Rootworm Management

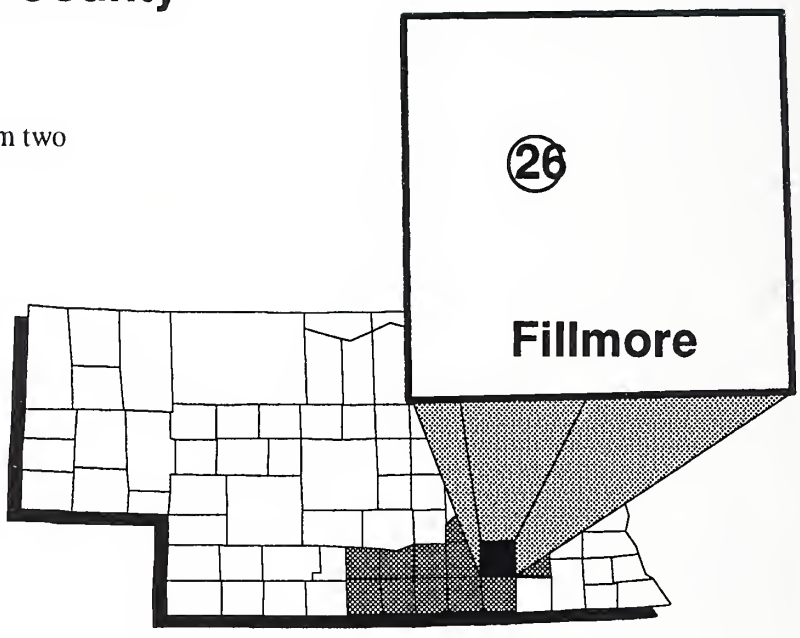


Corn Borer Management



Site 26

Howard Lefler - Fillmore County



General Information:

Site 26 is located on the Howard Lefler farm two miles west and one mile south of Fairmont in Fillmore County. Howard normally rotates between corn and soybeans, but planted corn following corn this year. The soil type is a Crete silt loam with a 0-3 percent slope.

Howard shredded stalks on April 27, prior to planting 30-inch rows of Pioneer 3162 on May 5.

Nitrogen Management

Howard included nitrogen rate comparison plots in this field. The plots were 11 rows wide, 1295 feet long, and replicated four times. Howard's yields were lower than average due to 50 percent green snap from the July 8 wind storm. He applied the entire amount of nitrogen as anhydrous ammonia on June 1, except for six pounds which he applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation nitrogen accounted for 1.7 ppm nitrate nitrogen in samples drawn in 1993. Irrigation water credit is calculated by multiplying the ppm nitrate by two. This was conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.5
OM	2.60%
P	10 ppm
K	379 ppm
Zn	2.93 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	108	158	208
Yield avg. (bu/acre)	114	118	119
Test wt. (lbs/acre)	55	55	55
Moisture (%)	21.9	22	22.1

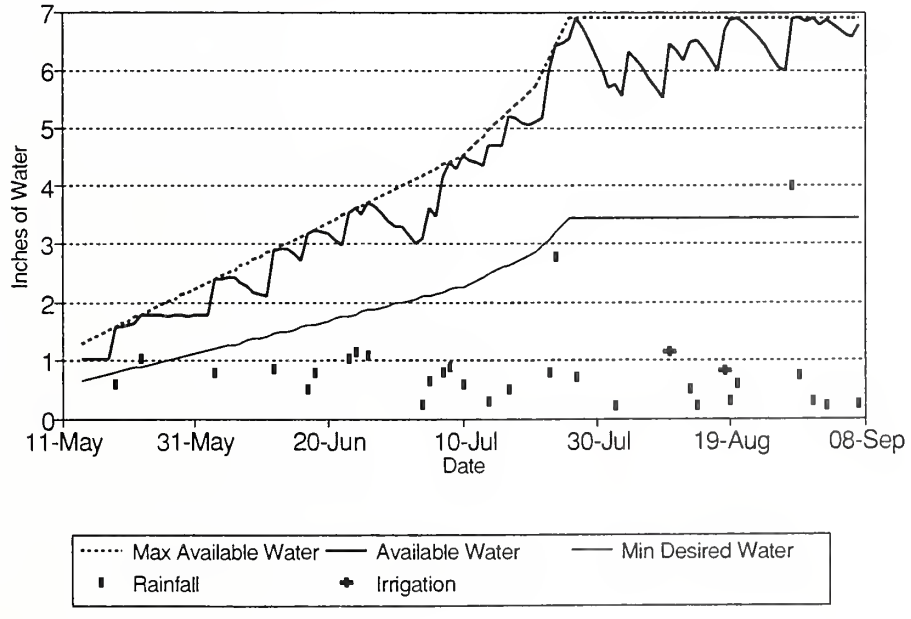
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	2-Year Average	
	-50				87	205		
1992	**Rec**		52	180	137	206	Avg. N	Avg.
	50+				187	208	Applied	Yield
	-50		49		108	114	98	160
1993	**Rec**		50	180	158	118	148	162
	50+		66		208	119	198	164

Irrigation Management

This site is pivot irrigated. Irrigation was scheduled in 1993 based on soil moisture blocks, and the checkbook method. The field received 23.50 inches of rainfall between May 14 and September 7 and 1.14 inches of water was applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, as indicated by the lower line.



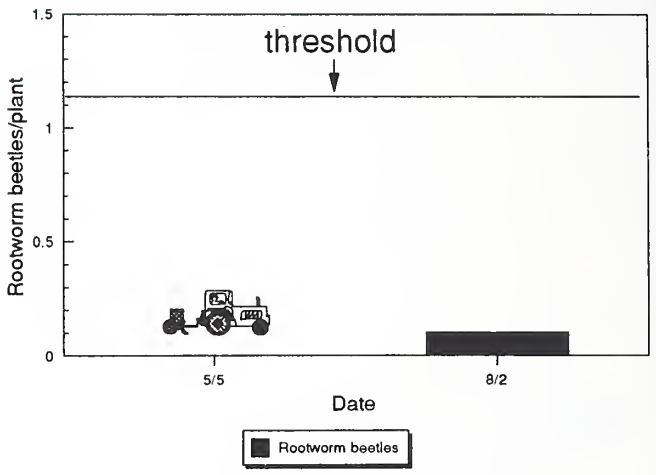
Integrated Pest Management:

Howard cultivated twice. He applied Aatrex in a band on May 5.

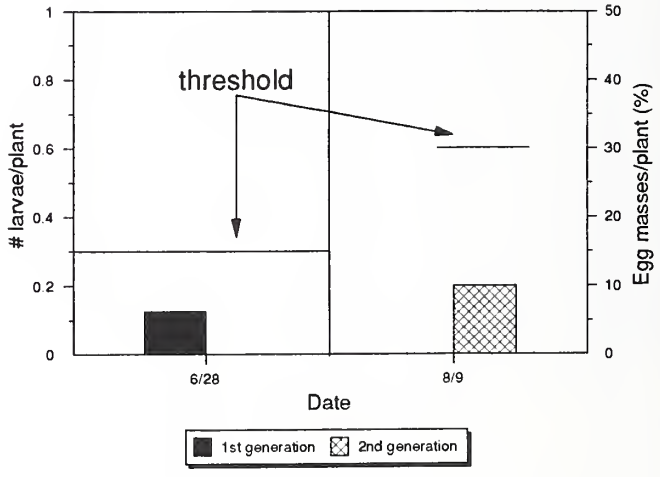
Rootworm control was achieved using 8.8 pounds of Force in a band on May 5. Howard did not have threshold levels of rootworm beetles and should be able to eliminate the soil treatment in 1994.

European corn borer did not reach threshold levels for either generation.

Rootworm Management

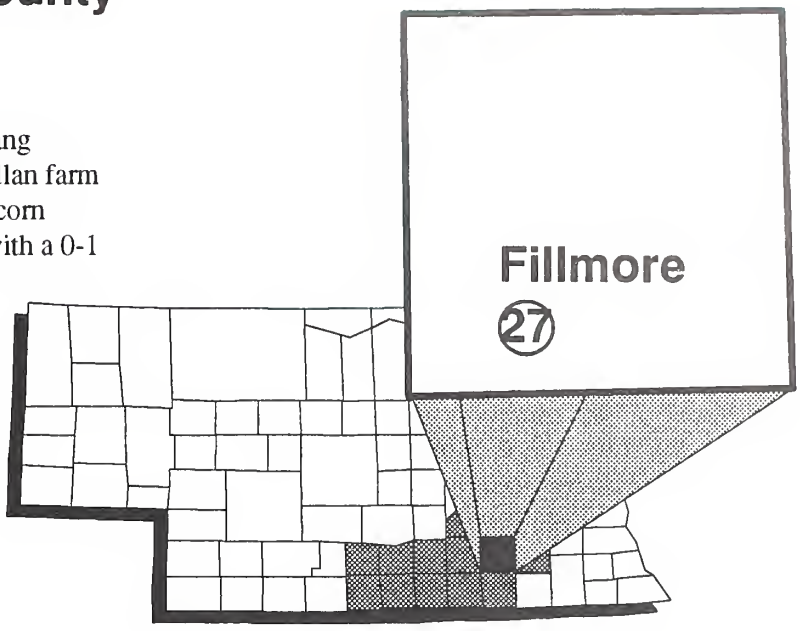


Corn Borer Management



Site 27

Jim Bedlan - Fillmore County



General Information:

Site 27 is located 2 1/2 miles west of the Strang junction of Highways 81 and 74 on the Jim Bedlan farm in Fillmore County. This field is in continuous corn production. The soil type is a Crete silt loam with a 0-1 percent slope.

Jim shredded stalks in the fall, prior to ridge planting Pioneer 3563 in 30-inch rows on May 5.

Nitrogen Management

Jim included nitrogen rate comparison plots in this field. The plots were eight rows wide, of varied length, and replicated four times. He applied the entire amount of nitrogen as anhydrous ammonia on April 27, except for seven pounds which he applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation nitrogen accounted for 3.4 ppm nitrate nitrogen in samples drawn in 1993. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	6.1
OM	2.70%
P	16 ppm
K	430 ppm
Zn	3.78 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	92	142	192
Yield avg. (bu/acre)	100	110	107
Test wt. (lbs/acre)	60	60	60
Moisture (%)	15.7	15.9	15.7

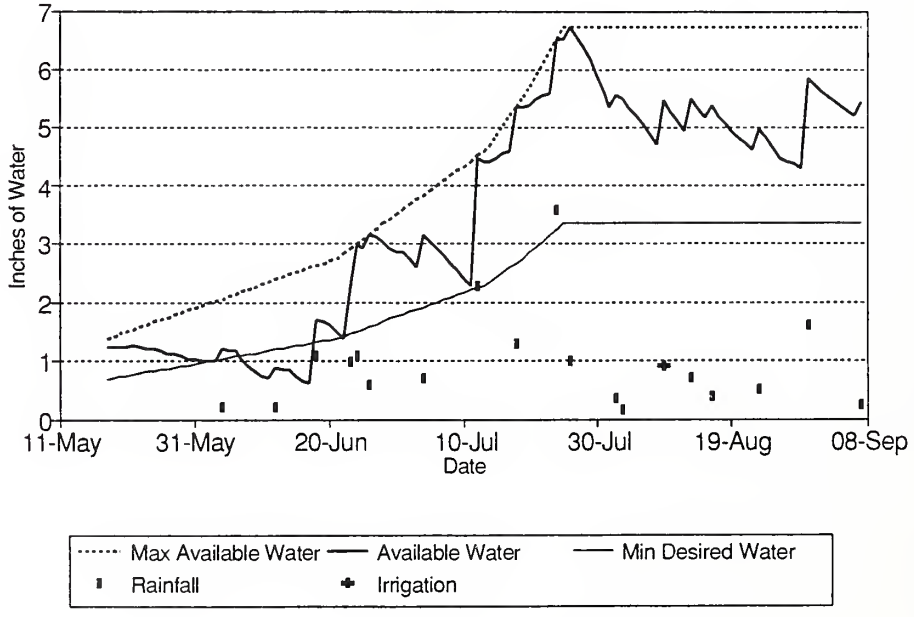
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	2-Year Average	
	-50				70	151		
1992	**Rec**		230	180	120	159	Avg. N	Avg.
	50+				170	160	Applied	Yield
	-50		66		92	100	80	126
1993	**Rec**	5	65	180	142	110	131	135
	50+		98		192	107	181	134

Irrigation Management

This site is gravity irrigated, watering every row and Jim used a surge valve on a portion of the field. Irrigation was scheduled in 1993 using appearance and feel, moisture blocks, and the checkbook method. The field received 17.05 inches of rainfall between May 18 and September 7 and 0.91 of an inch of water was applied in one irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



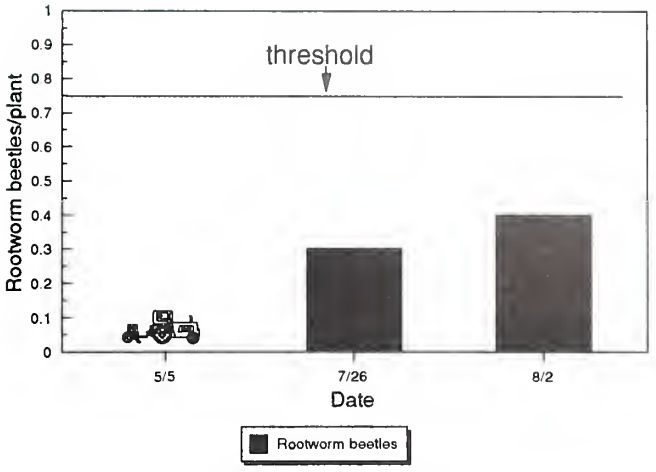
Integrated Pest Management:

Jim cultivated once and hilled. He applied Bicep in a band on May 5. He treated with Beacon in a band on May 18.

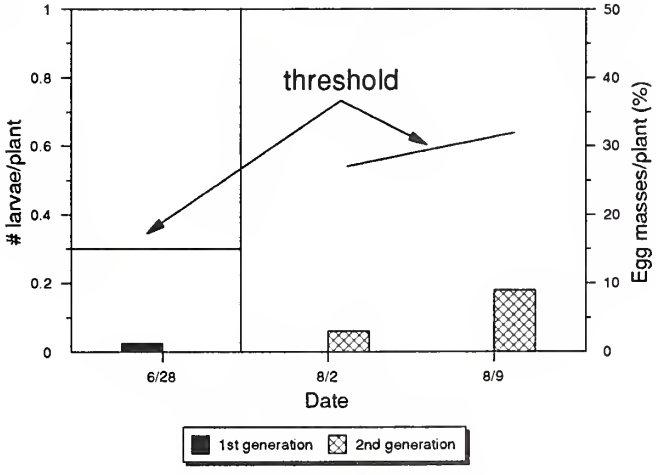
Rootworm beetles exceeded the threshold in 1992, so in 1993, Jim used Force on May 5 for rootworm larvae control. The beetles did not exceed the threshold this year, so he can eliminate the soil insecticide in 1994.

European corn borer did not exceed the threshold for either generation.

Rootworm Management

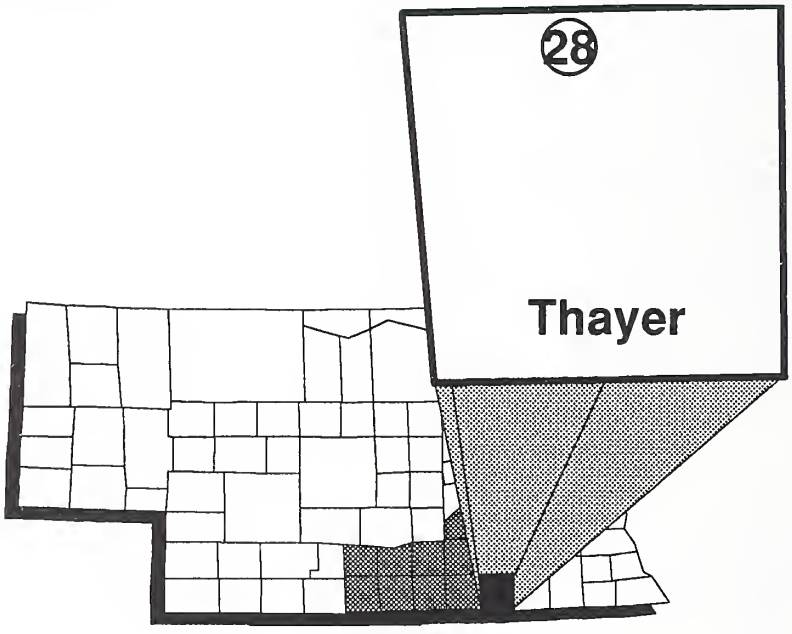


Corn Borer Management



Site 28

Leroy Voss - Thayer County



General Information:

Site 28 is located on the Leroy Voss farm 2 1/2 miles west of Bruning in Thayer County. This gravity-irrigated farm has been in continuous corn production. The soil type is a Crete silt loam with a 0-1 percent slope.

Leroy shredded stalks on May 2, prior to ridge planting Pioneer 3162 in 36-inch rows on May 25.

Nitrogen Management

Leroy included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1201 feet long and replicated three times. Leroy applied a 14-gallon mixture of equal amounts of 28-0-0 and 10-34-0 along with three gallons of sulfur in a 2X2 band with the planter on May 10. He sidedressed anhydrous ammonia on June 15.

The recommended rate of nitrogen was determined using a 160-bushel expected yield. The rate applied was calculated by subtracting soil and irrigation water nitrate from the nitrogen required for 160 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. Irrigation water nitrate accounted for 6.3 ppm nitrate-nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.3
OM	2.70%
P	21 ppm
K	349 ppm
Zn	4.38 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	88	138	188
Yield avg. (bu/acre)	92	102	105
Test wt. (lbs/acre)	56	56	56
Moisture (%)	24.8	25.1	25.1

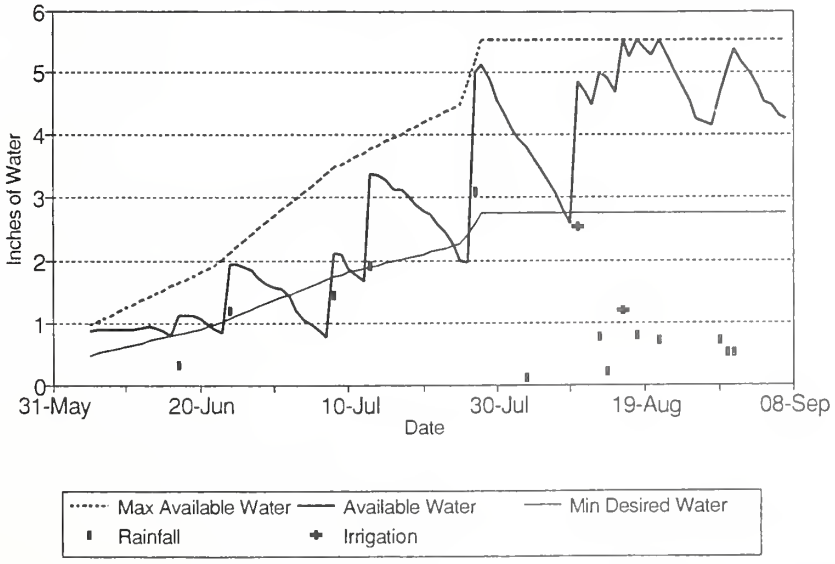
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
1991	-50				67	161		
	Rec		59	140	117	173		
	Rec Fall				117	190		
	50+				167	183		
1992	-50		16		101	105		
	Rec	13	52	1660	151	142		
	Rec Fall		26		151	129	Avg. N Applied	Avg. Yield
	50+		60		201	163		
1993	-50		31		88	92	85	119
	Rec	13	28	160	138	102	135	139
	Frmr. Rt.		64		210	102	159	140
	50+		27		188	105	185	150

Irrigation Management

This site is gravity irrigated, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. Soil moisture blocks were also used to determine moisture status. The field received 12.22 inches of rainfall between June 5 and September 7. There was 3.73 inches of water applied in two irrigations.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



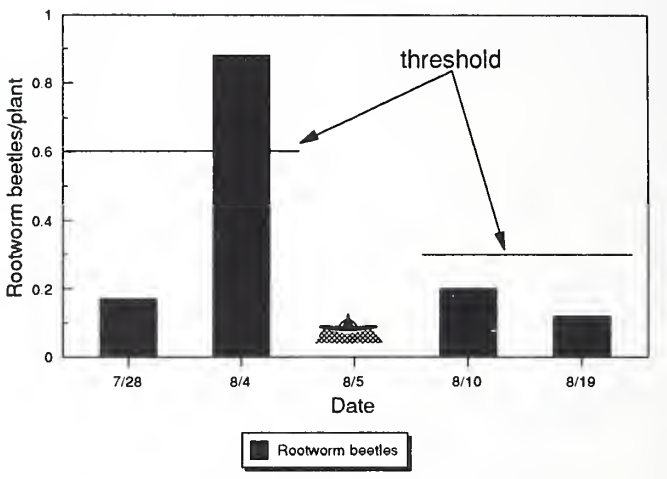
Integrated Pest Management:

Leroy cultivated once and hilled. He used a quart of Aatrex and broadcast Marksman on June 10.

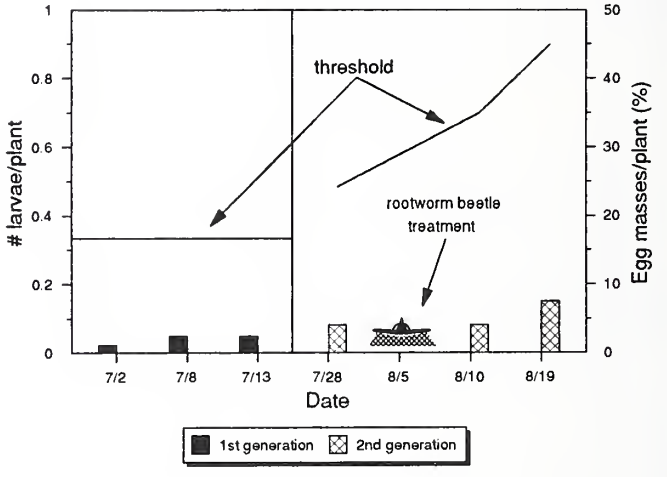
The rootworm beetle threshold was exceeded on August 4 and Leroy treated with Penncap-M on August 5. The beetle numbers did not rise above the threshold after the treatment.

European corn borer did not exceed the threshold for either generation.

Rootworm Management

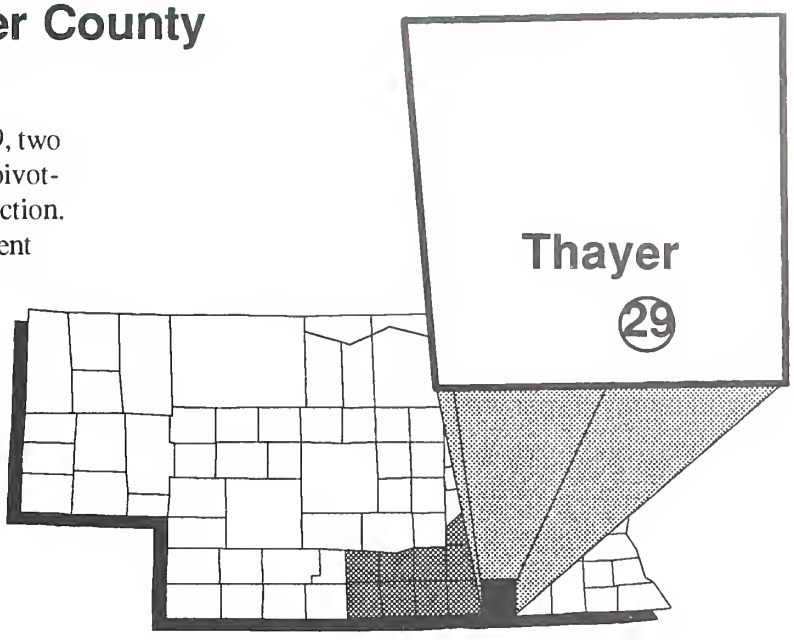


Corn Borer Management



Site 29

Effenbeck Farms - Thayer County



General Information:

The Effenbeck farm is the location of site 29, two miles north of Chester in Thayer County. This pivot-irrigated field has been in continuous corn production. The soil type is a Crete silt loam with a 1-3 percent slope.

Al shredded stalks on April 15, prior to disking and planting Pioneer 3345 I.R. on May 10 in 30-inch rows.

Nitrogen Management

Al included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1290 feet long and replicated four times. He applied anhydrous ammonia preplant.

The recommended rate of nitrogen was determined using a 170-bushel expected yield. The rate applied was calculated by subtracting soil and irrigation water nitrogen from the nitrogen required for 170 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation water accounted for 5.0 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.3
OM	3.00%
P	28 ppm
K	334 ppm
Zn	1.3 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	93	143	193
Yield avg. (bu/acre)	73	69	87
Test wt. (lbs/acre)	56	56	56
Moisture (%)	17.2	16.7	18.6

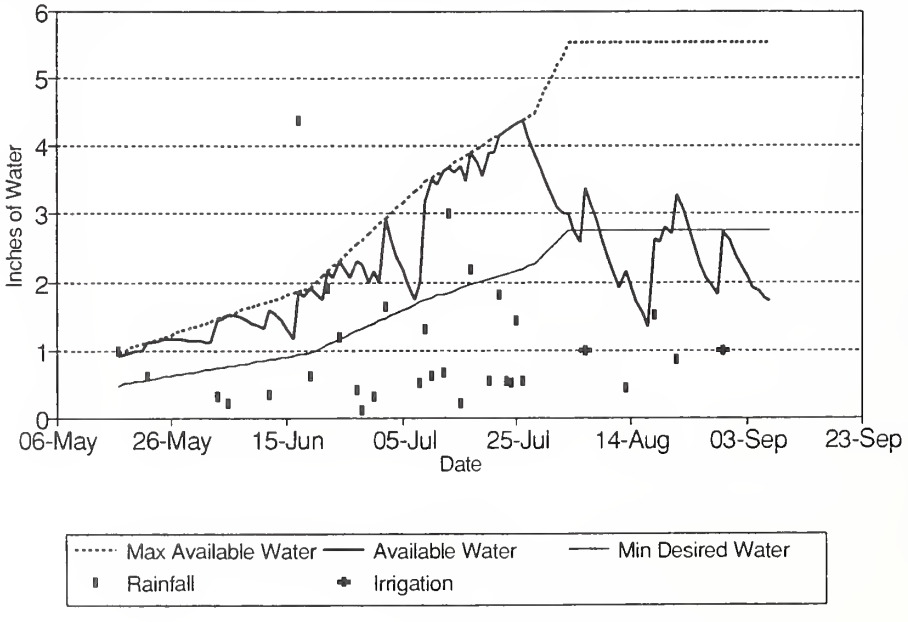
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				15	130		
1991	**Rec**		167	160	65	137		
	50+				115	139		
	-50	10	65		82	131		
1992	**Rec**	10	63	160	132	124	Avg. N	Avg.
	50+		103		182	133	Applied	Yield
	-50		37		93	73	63	111
1993	**Rec**	10	35	170	143	69	113	110
	50+		40		193	87	163	120

Irrigation Management

This site is sprinkler irrigated. Irrigation was scheduled in 1993 using soil moisture blocks, appearance and feel, and the checkbook methods. The field received 29.65 inches of rainfall between May 17 and September 7. There was no irrigation application in 1993.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



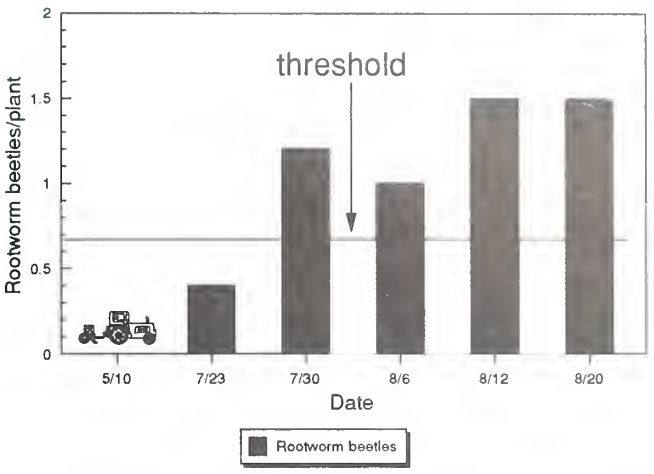
Integrated Pest Management:

Al cultivated two times.

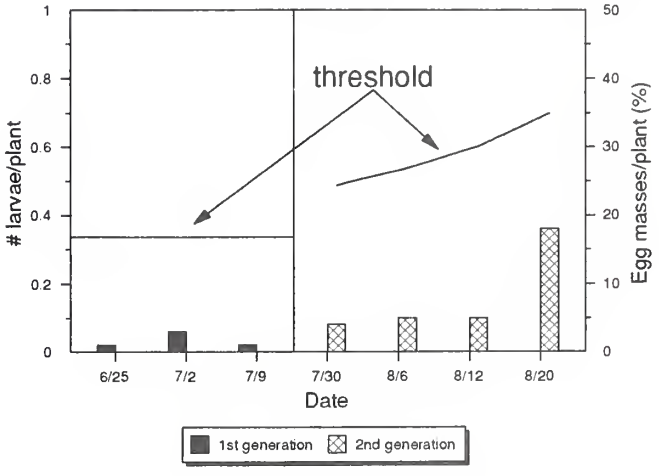
The rootworm beetle threshold was exceeded in 1992. Therefore, Al applied Force at planting for rootworm larvae control. The rootworm beetle numbers exceeded the threshold again in 1993, so he will need a soil insecticide in 1994 if he plants corn again.

European corn borer did not reach thresholds for either generation.

Rootworm Management

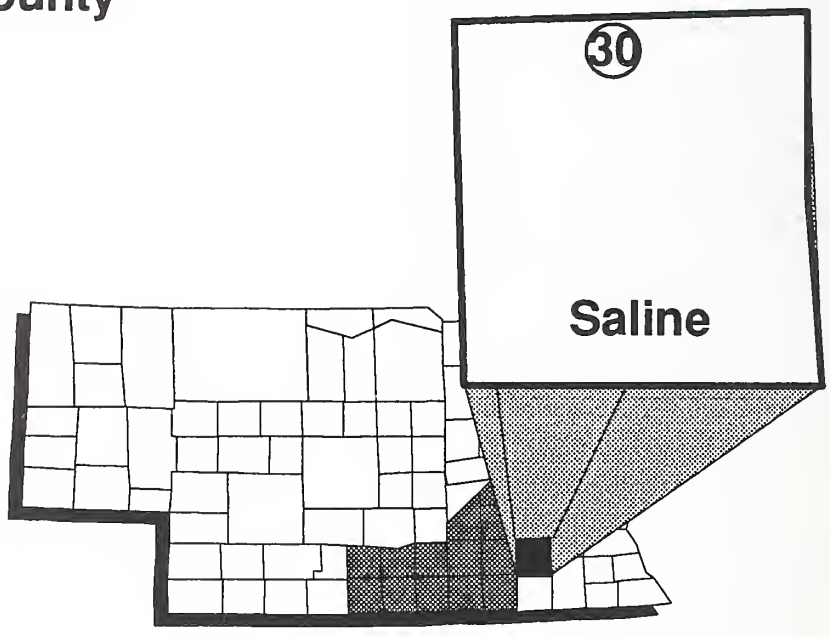


Corn Borer Management



Site 30

Keith Spohn - Saline County



General Information:

Site 30 is located three miles east and two miles north of Friend on the Keith Spohn farm in Saline County. The soil type is a Hastings silt loam with a 0-1 percent slope.

Keith disked in the fall and again on April 27 when he field cultivated and planted Pioneer 3162 in 30-inch rows.

General Fertility	
pH	6.1
OM	2.70%
P	56 ppm
K	408 ppm
Zn	3.41 ppm
S	8 ppm

Nitrogen Management

Keith did not include nitrogen rate comparison plots in this field. He applied a preplant application of 182 pounds of anhydrous ammonia on April 25 and he applied 10 gallons of 10-34-0 at planting.

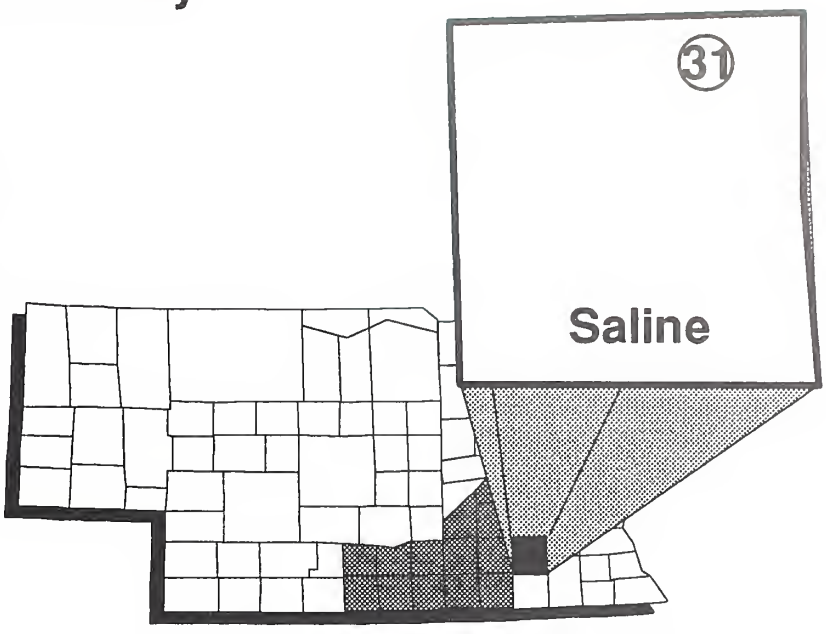
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	2-Year Average	
1991	-50	2			0	176		
	Rec		197	185	50	191	Avg. N Applied	Avg. Yield
	50+				100	204		
1992	-50	3	145		65	182	33	179
	Rec		194	200	115	202	83	197
	65+		433		180	215	140	210
1993		There was no nitrogen plot in 1993						

Irrigation Management

This site is pivot irrigated. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook method. Keith received 22.40 inches of rainfall between May 10 and September 7 and approximately 2.30 inches of water were applied in 2 irrigations.

Site 31

Wayne Hansen - Saline County



General Information:

Site 31 is located on the Wayne Hansen farm one mile north of Dorchester on Highway 15 in Saline County. The plot has been in continuous corn production, while other parts of the farm have been in a corn/soybean rotation. The soil type is a Crete silt loam with a 0-1 percent slope.

Wayne planted Jaques 8240 on May 14 in 30-inch rows.

Nitrogen Management

Wayne included nitrogen rate comparison plots in this field. The plots were 12 rows wide, 1896 feet long, and replicated four times. Wayne's yields reflected the effect of approximately 20 percent green snap for the July 8 wind storm. He applied the entire amount of nitrogen as anhydrous ammonia in a preplant application.

The recommended rate of nitrogen was determined using a 170-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 170 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation nitrogen accounted for 1.9 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	6.7
OM	2.90%
P	35 ppm
K	315 ppm
Zn	2.12 ppm
S	3 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	99	149	199
Yield avg. (bu/acre)	80	88	98
Test wt. (lbs/acre)	54	54	54
Moisture (%)	17.7	18.1	18.6

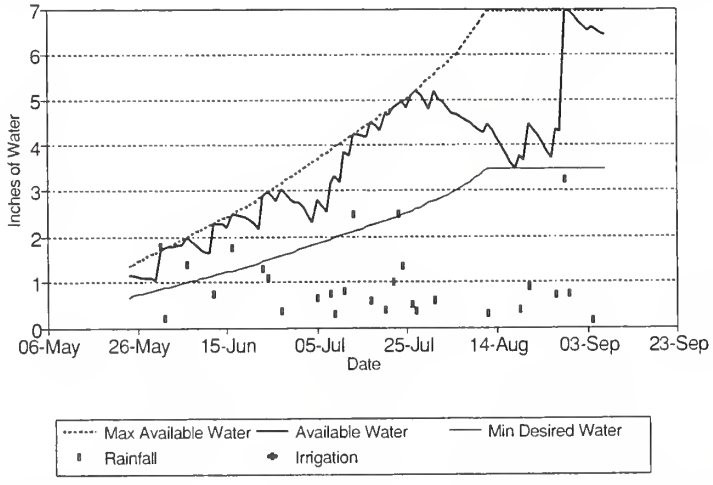
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				96	176		
1991	**Rec**		59	170	146	185		
	50+				196	192		
	-50		112		51	99		
1992	**Rec**	4	122	170	101	137	Avg. N	Avg.
	50+		147		151	161	Applied	Yield
	-50		34		99	80	82	118
1993	**Rec**	4	30	170	149	88	132	137
	50+		39		199	98	182	150

Irrigation Management

This site is gravity irrigated, watering alternate (every other) furrows. Irrigation was scheduled in 1993 using soil moisture blocks and the checkbook method. The field received 27.40 inches of rainfall between May 24 and September 7 and no irrigation water was applied.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Integrated Pest Management:

Wayne cultivated once and hilled. He applied a banded treatment of Lariat on May 14 with .7 quarts of atrazine included.

Rootworm beetles exceeded the threshold in 1992, so in 1993 Wayne treated the field with Counter 20CR at planting.

European corn borer did not reach thresholds for treatment for either generation.

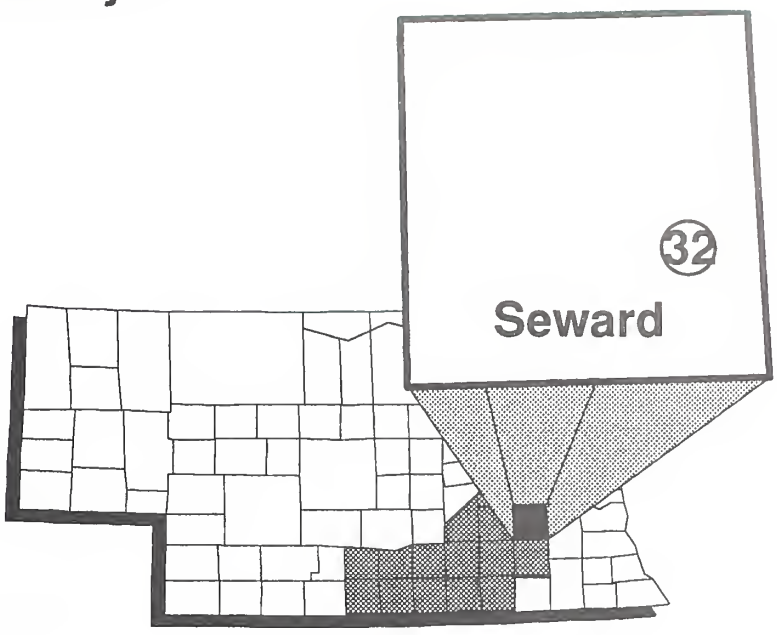
Site 32

Dean Rocker - Seward County

General Information:

The Dean Rocker farm is the location of site 32, $2^1/_2$ miles east and one mile south of Tamora. This gravity-irrigated farm has been in continuous corn production. The soil type is a Fillmore silt loam with a 0-1 percent slope.

Soybeans were planted on the plot in 1993.



Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	2-Year Average	
	-50				80	167		
1991	**Rec**		92	180	130	171	Avg. N Applied	Avg. Yield
	50+				180	168		
	-50	4	58		92	159	86	163
1992	**Rec**		72	180	142	161	136	166
	65+		156		192	173	186	171
1993		Soybeans were planted in the plot area in 1993						

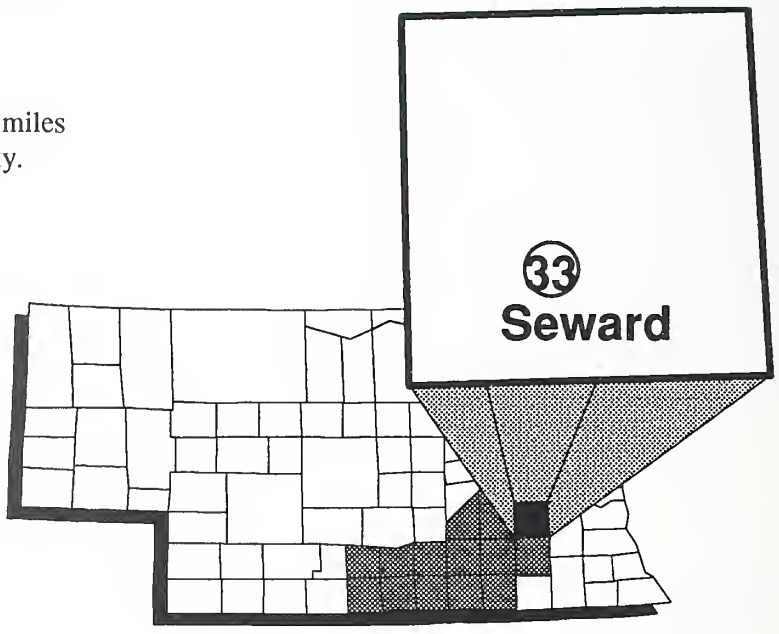
Site 33

Doug Cast - Seward County

General Information:

Site 33 is located on the Doug Cast farm two miles south and one mile east of Utica in Seward County. This gravity-irrigated farm is in continuous corn production. The soil type is a Fillmore silt loam with a 0-1 percent slope.

Doug knifed in NH_3 on April 28, prior to harrowing and ridge planting NC+ 4616 on May 5 in 30-inch rows.



Nitrogen Management

Doug included nitrogen rate comparison plots in this field. The plots were eight rows wide, 1670 feet long, and replicated four times. Doug's yields were lower than average due to 25 percent green snap from the July 8 storm. He applied the entire amount of nitrogen as anhydrous ammonia on April 28, except for four pounds which he applied with the seed in the form of 10-34-0 liquid starter.

The recommended rate of nitrogen was determined using a 180-bushel yield goal. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 180 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation nitrogen accounted for 17.6 ppm nitrate nitrogen in samples drawn in 1991. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application on nine inches of water.

General Fertility	
pH	7
OM	2.00%
P	8 ppm
K	297 ppm
Zn	.94 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	106	156	206
Yield avg. (bu/acre)	101	105	107
Test wt. (lbs/acre)	52	52	52
Moisture (%)	1801	18	18.4

Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	3-Year Average	
	-50				120	161		
1991	**Rec**		71	180	170	168		
	50+				220	169		
	-50		105		0	89		
1992	**Rec**	36	142	180	50	134	Avg. N Applied	Avg. Yield
	50+		138		100	153		
	-50		33		106	101	75	117
1993	**Rec**	36	41	180	156	105	125	136
	50+		48		206	107	175	143

Irrigation Management

This site is gravity irrigated, watering alternate (every other) furrows. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook method. No irrigation occurred in 1993.

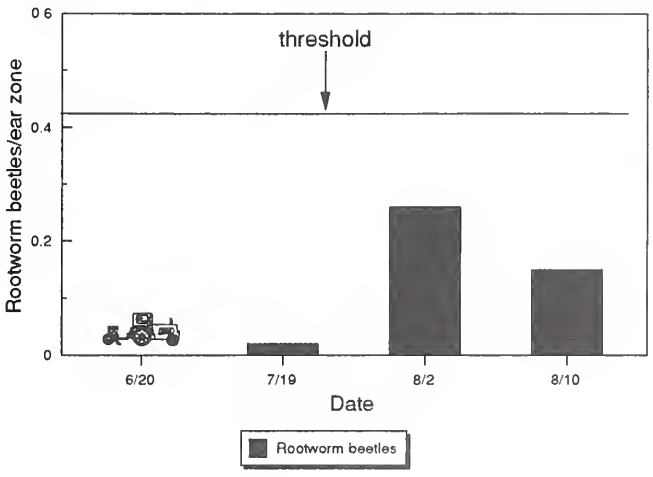
Integrated Pest Management:

Doug cultivated twice and hilled. He applied Bullet in a band on May 5.

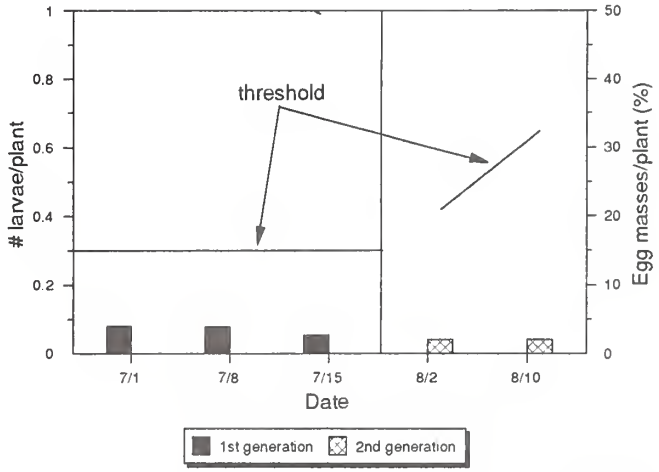
Rootworm beetles exceeded the threshold in 1992, so Doug applied six ounces of Thimet with the cultivator on June 20 for rootworm larvae control. Rootworm beetles did not reach the threshold in 1993, so he can go without soil insecticide in 1994.

European corn borer did not reach the threshold for either generation.

Rootworm Management

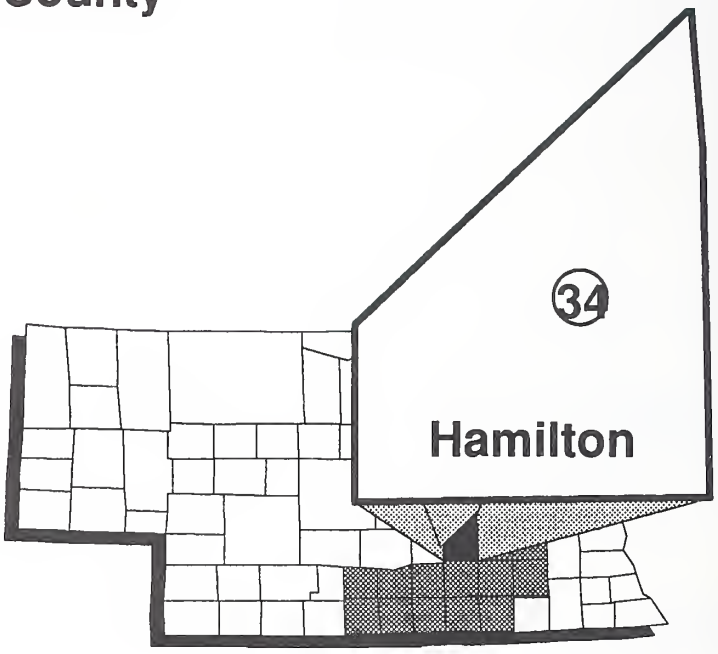


Corn Borer Management



Site 34

The Grain Place - Hamilton County



General Information:

Site 34 is operated by Mike Herman of the Grain place and it is located $5^1/_2$ miles north of Aurora in Hamilton County. The soil type is a Holder silt loam with a 0-1 percent slope.

The Grain Place is an organic farm. The operators employ a systems approach to crop production which requires extensive crop rotation. The crop rotation is based on developing yield potential over the complete cycle of the rotation, rather than the expected yield of any given year. The yield potential is obtained through the availability of nutrients, the disruption of pest cycles and the control of soil erosion. Water quality is directly affected by this systems approach to crop production.

The goal of this approach is to reduce to a minimum, the purchased inputs of nutrients and pesticides, which are a primary source of non-point-source pollution. The current rotation features changes in plants from grasses to broadleaf. This gives the Grain Place the opportunity to use plant competition, cultivation and hand rogueing to control weeds. It also disrupts insect cycles; for instance, corn root worm is not a problem in the fields. The legumes in the rotation help to build nitrogen levels in the soil.

The Grain Place is planning a new rotation to allow three-year stands of a forage crop, consisting of alfalfa, red clover and grasses. This will allow the establishment of only $^1/_3$ of the total forage acres in any given year and it will allow the grasses to become a higher percent of the stand by the third year. This portion of the rotation will help build the soil's health, tilth and nutrient base.

The current and future crop rotations reduce the number of acres requiring water due to better water retention of the soil and the elimination of large amounts of fertilizer. The Grain Place's irrigation practices also include using flow meters, surge valves, moisture blocks, crop water use data and irrigation scheduling to attempt to minimize water application without excessive stress on the crop—and hopefully reduce nutrient leaching below the root zone.

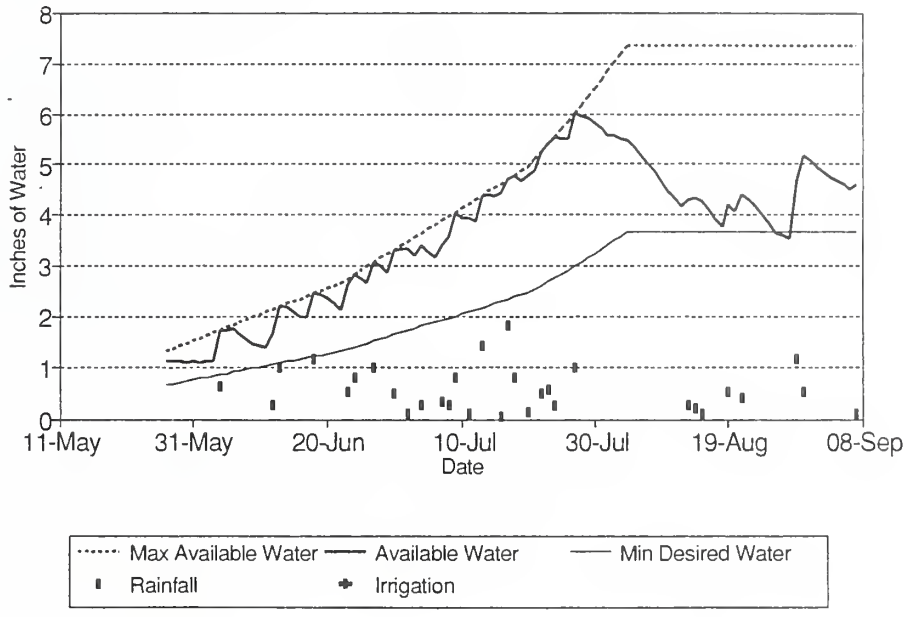
The Grain Place uses on-farm manure and screenings from the on-farm processing plant for compost, which is spread on those areas of a given field which traditionally have had lower yields.

Mike disked and cultipacked on April 26/27. He disked again on May 5 and cultipacked on May 14/15, prior to planting Pioneer 3532 on May 15. Mike didn't apply any organic fertilizer this year.

Irrigation Management

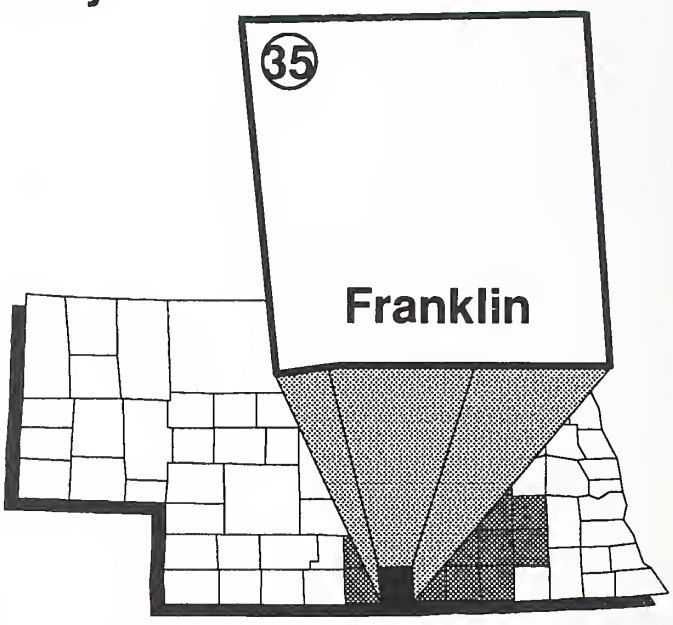
The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge the soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



Site 35

Butch Ortgiesen - Franklin County



General Information:

The Butch Ortgiesen farm is the location of site 35, seven miles south and one mile east of Wilcox in Franklin County. The plot is in continuous corn production. The soil type is a Holdrege silt loam with a 0-1 percent slope.

Butch shredded stalks on April 15, prior to planting Pioneer 3299 in 36-inch rows on May 5.

Nitrogen Management

Butch included nitrogen rate comparison plots in this field. The plots were eight rows wide, and 1456 feet long and replicated four times. He applied five pounds of nitrogen in a band at planting with a mixture of 32-0-0 and herbicide. He knifed in anhydrous ammonia on April 6.

The recommended rate of nitrogen was determined using a 175-bushel yield goal. The rate applied was calculated by subtracting soil nitrogen from the nitrogen required for 175 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. No irrigation water credit was given. Irrigation water credit was calculated by multiplying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

General Fertility	
pH	6.6
OM	2.90%
P	24 ppm
K	450 ppm
Zn	2.55 ppm

Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	121	171	221
Yield avg. (bu/acre)	121	130	134
Test wt. (lbs/acre)	53	53	53
Moisture (%)	19.1	19.6	19.4

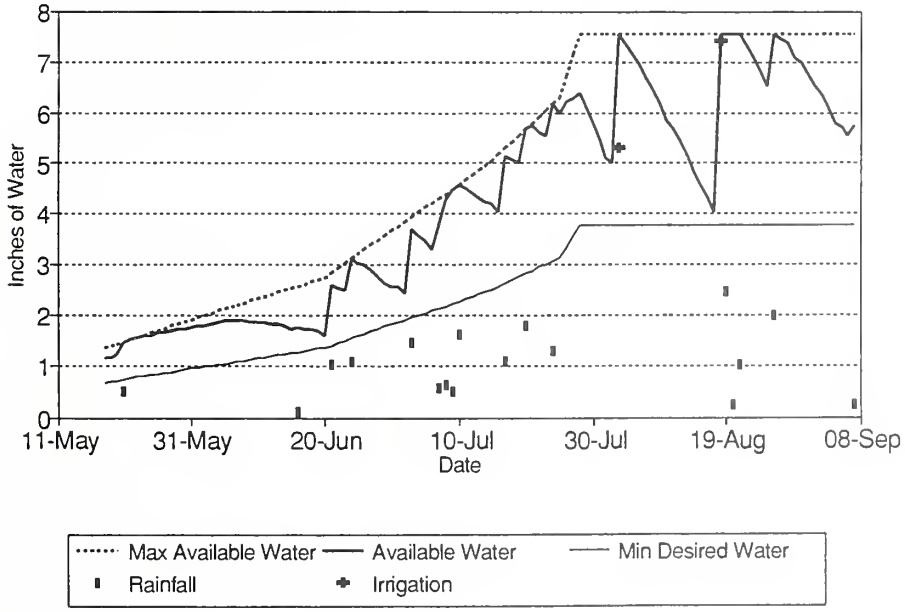
Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	2-Year Average	
	-50				111	186		
1992	**Rec**		62	175	161	195	Avg. N Applied	Avg. Yield
	50+				211	193		
	-50		27		121	121	116	154
1993	**Rec**		31	175	171	130	166	163
	50+		56		221	134	216	164

Irrigation Management

This site is gravity irrigated, watering every furrow. Irrigation was scheduled in 1993 using the appearance and feel and the checkbook methods. The field received 17.90 inches of rainfall between May 18 and September 7 and 12.71 inches of water was applied in two irrigation.

The graph represents the moisture status of the field during the crop season. The upper line indicates field capacity, or the maximum amount of water storable in the root zone after drainage by gravity. It increases with time as the root zone expands. The middle line indicates soil moisture status and is based on a volume balance using estimates of evapotranspiration. Rainfall and irrigation recharge soil moisture. When the middle line reaches the upper line, runoff and/or deep percolation of water has occurred.

Scheduling should attempt to recharge the soil before 50 percent depletion occurs, indicated by the lower line.



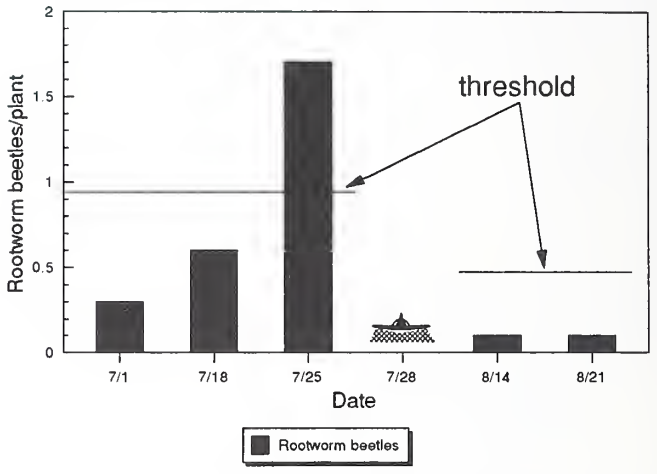
Integrated Pest Management:

Butch cultivated once and hilled. He banded Bicep II on May 5.

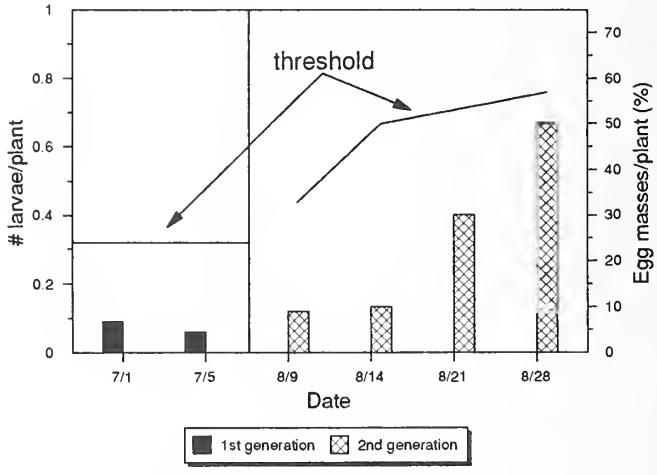
The rootworm beetle threshold was exceeded on July 25 and he treated with Penncap-M on July 28. The beetle numbers did not return to threshold levels.

European corn borer did not reach the threshold for either generation.

Rootworm Management

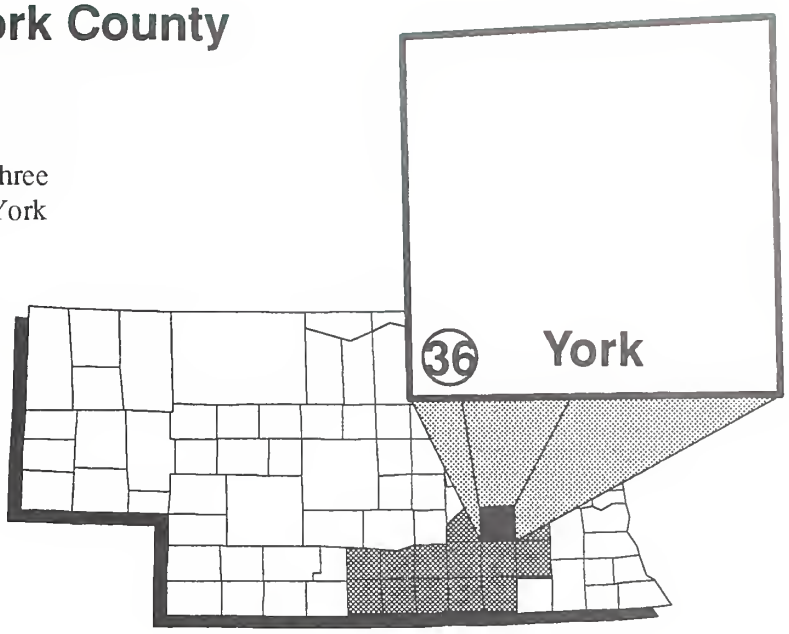


Corn Borer Management



Site 36

Site 36 Brian Janzen - York County



General Information:

Site 36 is located on the Brian Janzen farm three miles south and $3^1/_2$ miles east of Henderson in York County. The soil type is a Hastings silt loam with a 0-1 percent slope.

Brian shredded stalks on April 22, prior to planting Pioneer 3162 in 36-inch rows on April 29.

Nitrogen Management

Brian included nitrogen rate comparison plots in this field. The plots were six rows wide, 1283 feet long, and replicated four times. Brian applied the entire amount of nitrogen as anhydrous ammonia on April 26.

The recommended rate of nitrogen was determined using a 170-bushel expected yield. The rate applied was calculated by subtracting soil and irrigation nitrogen from the nitrogen required for 170 bushels of corn. The soil nitrate was measured in four-feet deep soil samples taken from the 1992 recommended rate strips. The irrigation nitrogen accounted for 2.7 ppm nitrate nitrogen in samples drawn in 1993. Irrigation water credit was calculated

General Fertility	
pH	6.4
OM	2.80%
P	32 ppm
K	496 ppm
Zn	1.12 ppm
S	7 ppm

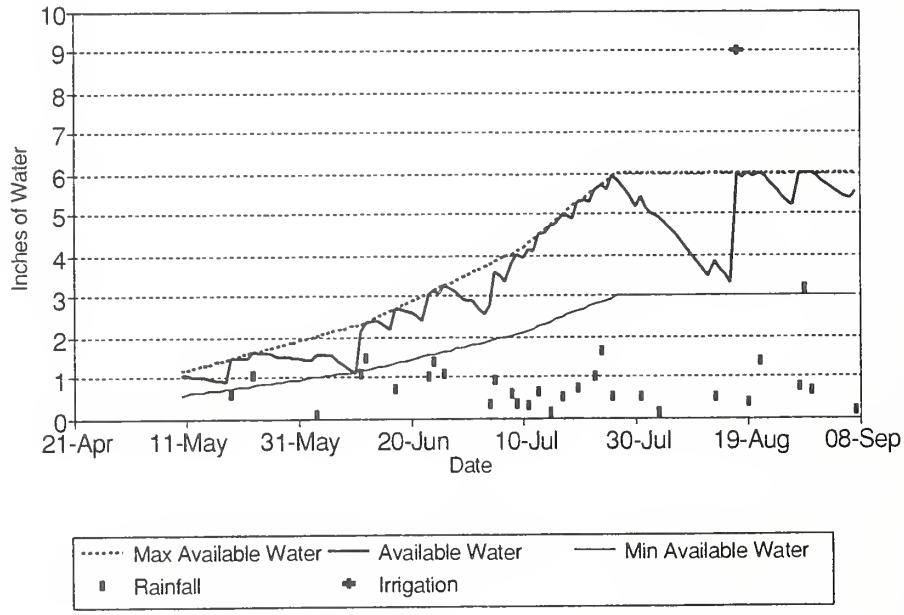
Treatment-1993	-50	Rec	+50
N rate (lbs/acre)	130	180	230
Yield avg. (bu/acre)	117	121	120
Test wt. (lbs/acre)	54	54	54
Moisture (%)	21.8	22	21.6

Year	Treatment	Water N (lbs/a)	Soil Res. (lbs/a)	Expected Yield (bu/a)	N applied (lbs/a)	Yield (bu/a)	2-Year Average	
	-50				130	175		
1992	**Rec**		37	170	180	178	Avg. N	Avg.
	50+				230	177	Applied	Yield
	-50		41		130	117	130	146
1993	**Rec**		57	170	180	121	180	150
	50+		82		230	120	230	149

plying the ppm nitrate by two. This is conservative and is based on a yearly application of nine inches of water.

Irrigation Management

This site is gravity irrigated, watering every furrow. Irrigation was scheduled in 1993 using soil moisture blocks and the checkbook method. The field received 26.30 inches of rainfall between May 10 and September 7, 1993. There was not a flow meter on this well, but Brian estimated approximately 9 inches of water was applied in one irrigation.



Integrated Pest Management:

Brian cultivated once and hilled. He applied a banded treatment of 1.7 pounds of atrazine on April 29. Brian scouted his own fields. He applied Lorsban 15G in a band on April 29 for rootworm control. European corn borer did not reach threshold levels for either generation.

Economic Impact 1993

Results of using Best Management Practices to reduce input costs

The Mid-Nebraska Water Quality Demonstration Project strives for the efficient use of resources. The implication is that management practices allow waste of chemicals and water in some cases. Demonstrations of alternative approaches and the use of research-based techniques help producers see how those different approaches might work on their farm. Those approaches are called best management practices (BMPs) and are listed on pages 5 and 6 of this report.

The recommended BMPs are designed for profitability as well as environmental protection. Some practices--mainly related to irrigation--involve substantial investment and may be subsidized with cost-share from the USDA and Natural Resources Districts.

A basic system is defined below in order to describe the recommended changes and the expected economic effect of those changes.

The Basic System does not utilize deep soil sampling and **routinely applies 180 pounds of nitrogen** per acre every year. This is a continuous corn system that is **not using beetle counts** to determine treatment thresholds. Instead, soil insecticide is applied every year. This is a gravity flow irrigation system that aims to keep the crop fully irrigated with **no schedule to allow 50 percent depletion** before recharge.

The BMP systems can be applied in three different ways, depending on irrigation system used.

BMP System 1

The changes made are:

- deep soil sample and credit residual N
- irrigation water sample and credit for N
- hire a scout and use corn rootworm beetle thresholds
- install a water flow meter to help evaluate irrigation
- schedule irrigation and irrigate to a 50 percent depletion
- select best combination of set-times and gates to have a happy medium between runoff and deep percolation

These BMPs could result in a 75-pound reduction of nitrogen applied--60 pounds by accounting for soil nitrate and 15 pounds by accounting for nine inches of irrigation water that has 7.5 ppm nitrate nitrogen.

Scouting provides a reduction of soil insecticide. The anticipated need for rootworm control is reduced to one year in three.

The changes in irrigation management are likely to result in the elimination of one or two irrigations and improved efficiency related to better distribution of water.

BMP System 1 could reduce cost per acre by **$20.52 per acre.** Reducing nitrogen saved $9.01, reducing insecticide saved $1.63 and water savings accounted for another $9.89.

BMP System 2

The system is the same as BMP System 1 except an irrigation reuse system is installed with 50 percent cost-share.

This added BMP has the effect of increasing irrigation efficiency by capturing and reusing 3.4 inches of irrigation water. Without cost-share, this irrigation system is $5.81 per acre more expensive than the basic system.

BMP System 2 with cost-share could reduce cost per acre by **$14.64 per acre.**

BMP System 3 The system is the same as BMP System 1 except surge irrigation is used for improved water management.

This added BMP has the effect of increasing irrigation efficiency and reducing the amount of water used. It works by altering the infiltration rate in the furrow, reducing the irrigation advance time. This allows a change to shorter set times or an increase in the number of gates per set.

Table 4. Costs of selected BMPs.

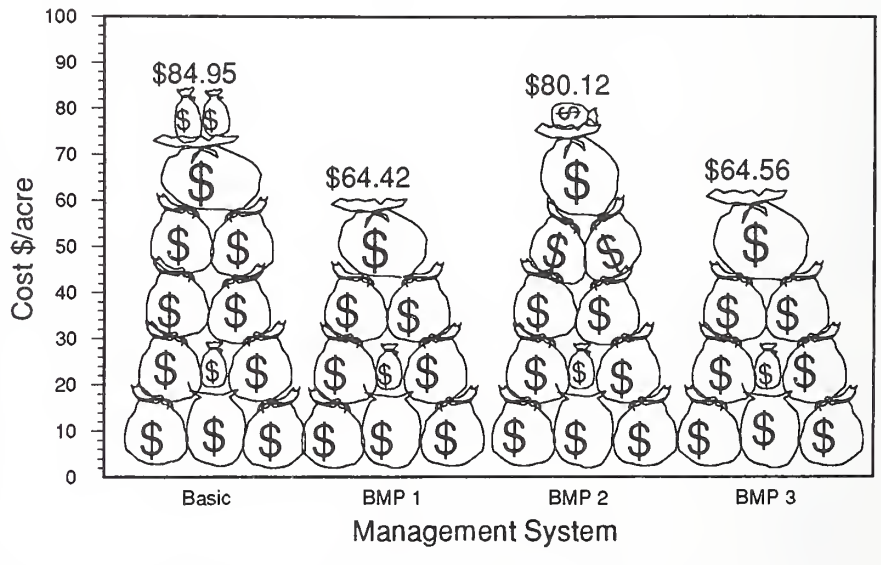
Selected Practices	Basic	BMP System 1	BMP System 2	BMP System 3
Soil & water sampling	$1.01	$1.75	$1.75	$1.75
Nitrogen product & application	28.4	18.65	18.65	18.65
Scouting rootworm beetles	0	2.78	2.78	2.78
[a]Soil insecticide	6.61	2.21	2.21	2.21
Irrigation scheduling	0	2.78	2.78	2.78
[b]Irrigation equipment, water, labor	48.93	36.26	51.96	36.4
TOTAL	84.95	64.42	80.12	64.56

[a]...Routine use of soil insecticide under basic system. Scouting for beetles & using threshold guidelines reduces application once in three years.
[b]Scheduling to 50 percent deficit is likely to reduce gross water applied through the season. Reuse pit adds to cost of System 2; a surge valve to System 3. The Basic System applies 21", System 1 applies 14.5", system 2 applies 11.1" & System 3 applies 13.6".

BMP System 3 could reduce cost per acre by **$20.38 per acre.**

Table 4 and Figure 4 show the different economic impacts BMPs have on the basic system described previously.

Figure 4. Economic effects of Best Management Practices.



Furrow Irrigation Evaluation

Performance of furrow irrigation systems is affected by field traits and management. Some field traits, such as soil texture, are not easily changed. Others, such as slope and furrow length, can be changed within limits. Management offers the greatest flexibility, allowing farmers to change number of gates per set, set time and every row or every other row irrigation.

The Problem

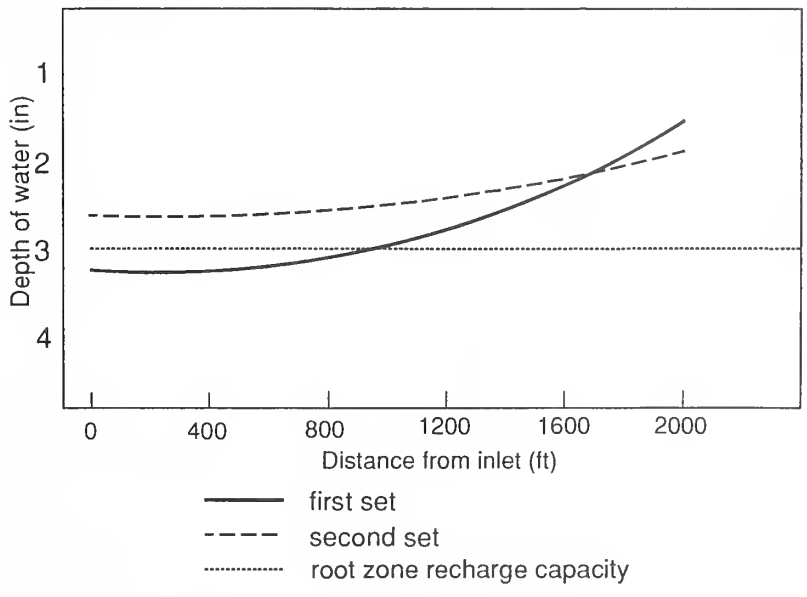
Soil is porous, allowing water to move through it. Even when soil is wet, water continues to move downward through it. This movement is called the infiltration rate.

Furrow irrigation is operated by applying water at one end of the field and letting gravity pull it to the other end. The process is fairly slow, taking several hours to travel 1300 or perhaps even 2600 feet. All the time water is moving along the furrow, it is infiltrating through the soil.

Nitrate is an ion that is water soluble. Water moving through soil will carry nitrate with it. It is not a problem as long as it moves short distances, as the root growth will keep pace with the nitrogen.

If it takes too long to get water to the end of the furrow, the opportunity for water to leach nitrate beyond the root zone is great. Therefore, furrow irrigation systems must be evaluated to determine if it is taking too long to move water down the furrow and to determine how the rate might be changed. Figure 5 shows the problem graphically.

Figure 5. A typical furrow irrigation situation in South-Central Nebraska



The Solution

A system has been developed to help farmers evaluate a furrow irrigation system without consuming too much time. The system has been computerized to accelerate the analysis and this computer program is called **the Volume Balance Model-Modified (VBMM).**

The system requires 11 pieces of information:

1. soil texture (sand, loam, clay)
2. water flow rate in gallons/minute
3. set time in hours
4. average number of hours for water to move to the furrow end
5. average furrow length
6. average slope percent
7. average row spacing
8. average wetted furrow spacing (irrigating every row or every other row)
9. number of gates open
10. estimated soil moisture deficit in inches
11. furrow shape

The model will *estimate* the amount of infiltration at eight locations along the furrow. It will *estimate* how much water is running off the field. The model is not intended to give a precise description of what is occurring on the set because the data consists of estimates and averages. **It does give a basis for predicting what changes can be made to improve the system.** It is quick and easy and can be done in the course of routine field work.

The system was used on several fields in the 15-county Mid-Nebraska Water Quality Demonstration Project area. One of the sites was on the Mark Bailey farm in Clay County. Figure 5 on page 98 and table 5 shows the effect of changing set time and gates on water distribution.

Table 5. Effects of changing set time & gates on water distribution.

	Set Time (hours)	Gates Open	Advance Time (hours)	Gross Application (hours)	Cutoff Ratio
Set 1	12	60	9	3.2	0.75
Set 2	8	40	4	3.2	0.5

•Assume a loam soil with a reuse pit.

On his first set Mark had adequate soak in the upper end of the field, but was not getting enough water into the lower end. If he simply ran his set longer, he would have improved the infiltration at the lower end of the field, but the cost would be excessive infiltration at the upper end.

The change from a 12-hour set to an eight-hour set, coupled with reducing gates from 60 to 40, resulted in reduced advance time from nine hours to four hours, which resulted in more even distribution of water on the field and no infiltration beyond the root zone.

This model is available by contacting an Extension Office or the Soil Conservation Service. Developers of the software are Joel Cahoon and Dean Eisenhauer of the University of Nebraska-Lincoln.

An additional aid to determine if a system is providing a good distribution of water across the field is the concept of **cutoff ratio**. The cutoff ratio is obtained from the following formula: **Cutoff Ratio (CR) = advance time/set time.**

Table 6 shows recommended CR for different soil types and irrigation systems. Calculate the CR for the first set. If the ratio is smaller than recommended, the set time is too long in relation to the time it takes for water to move across the field. The results of a smaller than recommended CR is excessive runoff and/or water infiltration.

Should the CR be much larger than recommended, it is taking too long for water to move across the field in relation to set time. The results of this situation is likely to be excessive infiltration of water on the upper end of the field.

Table 6. Recommended cutoff ratios.

System Type	Recommended Cutoff Ratio		
	Sandy Soils	*Loamy Soils*	*Clayey Soils*
No Reuse	0.45	0.6	0.7
With Reuse	0.25	0.35	0.45
Blocked Ends	0.69	0.85	.9

Changes in set time, and/or number of gates open would improve the situation. Fewer gates open would likely improve the second situation.

Variable N Rate Demonstration

A demonstration of variable application rate technology was conducted in 1993 on the Jerry Stahr farm in York County. This was the second year for demonstrating variable rate application technology as part of the Mid-Nebraska Water Quality Demonstration Project. In 1992, the variable rate demonstration site was located on the Milton Ruhter farm in Adams County.

The soil type on the variable rate demonstration site in 1993 was a Hastings silt loam. Soil samples were collected in a grid pattern from the demonstration area in March. Soil cores were collected every 100 feet, to a depth of three feet. The upper eight inch depth was analyzed for nitrate and organic matter, and the eight- to 36-inch depth was analyzed for nitrate. A total of 60 cores were collected from the demonstration area.

From the soil sample information, maps of soil residual nitrate-nitrogen, organic matter, and the recommended fertilizer nitrogen rate were produced. These are shown in Figures 6, 7 and 8. Figure 6 is a map of the average nitrate-nitrogen concentration, in parts per million, in the upper three feet. The origin of the field is in the northeast corner; the view in Figure 6 is looking to the southwest. The average NO_3-N concentration in three feet, as mapped, ranged from approximately three ppm to 12 ppm. Figure 7 is a map of organic matter content in the upper eight inches of the field, with the same orientation as Figure 6. Organic matter was lowest in the southeast corner of the field and highest in the southwest corner. Figure 8 is the recommended fertilizer nitrogen rate map for the field. The University of Nebraska nitrogen recommendation for corn is based on an

Figure 6. Average residual nitrogen concentration to three-foot depth.

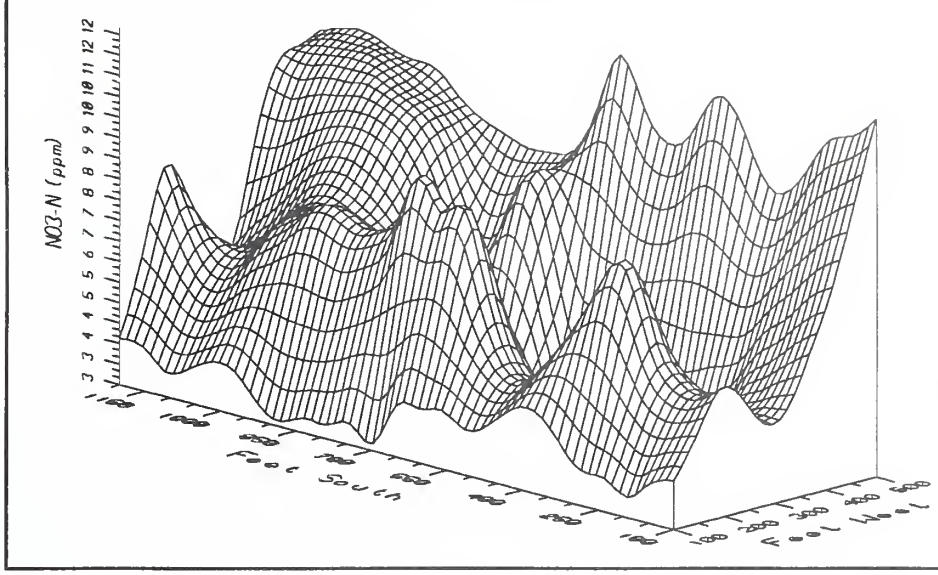
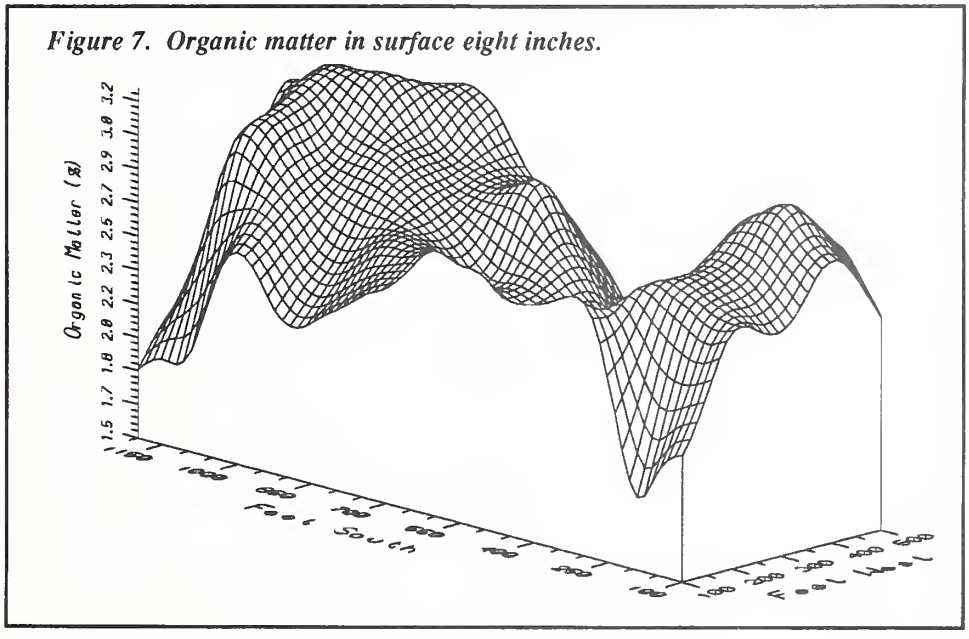
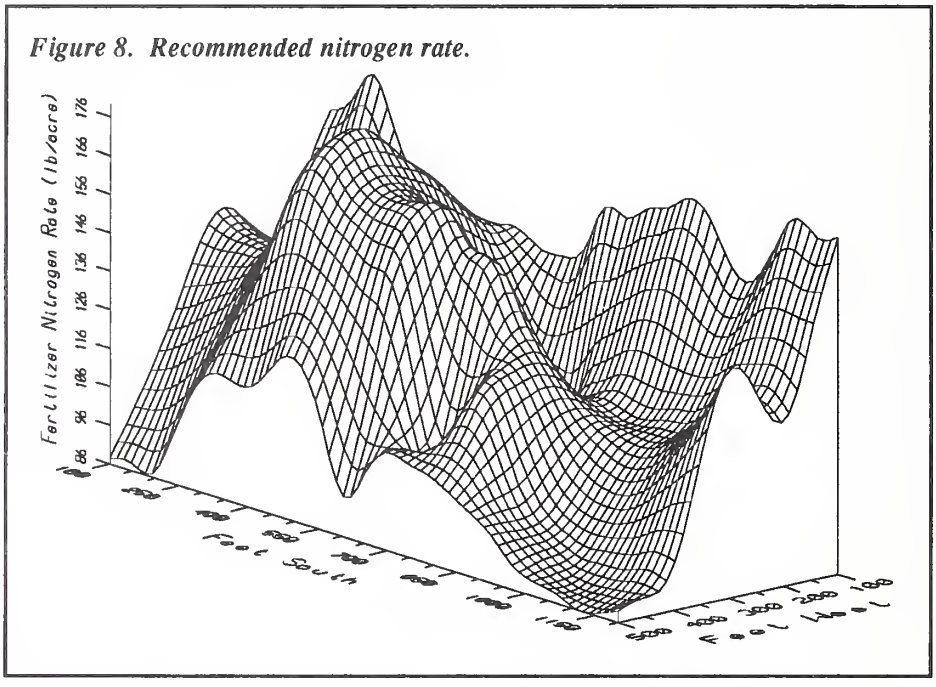


Figure 7. Organic matter in surface eight inches.



expected yield, average nitrate-nitrogen concentration in the soil profile, and organic matter in the upper eight inches. The UNL recommended nitrogen rate for this field ranged from approximately 85 pounds per acre to 175 pounds per acre. Figure 8 is oriented differently from the other two figures to allow better visibility of the recommended rates. The nearest corner to the viewer is the southwest corner of the field, as opposed to Figures 6 & 7 which were viewed from the northeast corner. Consequently, the viewer is looking toward the northeast in Figure 8. The lowest recommended nitrogen rate is located in the southwest corner, because of higher organic matter levels in that area, and in the northwest corner, due to a combination of higher organic matter and higher residual nitrate-nitrogen

Figure 8. Recommended nitrogen rate.



Anhydrous ammonia was sidedressed on the field on June 17. Two treatments were used: (1) a fixed nitrogen rate based on the average residual NO_3-N concentration and organic matter content for the whole field and (2) a variable nitrogen rate based on nitrate-nitrogen and organic matter at a given point in the field. Seven replications of each treatment were applied to randomized strips; each strip was 16 rows (row width = 30 inches) wide and ran the length of the field (approximately 1280 feet). The application map produced for the applicator, grouped nitrogen rates for the field into five rates in order to work properly with the software controlling the applicator. Actual rates applied to the field were 108, 123, 135, 147 and 165 pounds of nitrogen per acre, depending on the area of the field. The actual amount of nitrogen applied to each strip was accumulated and reported by software controlling the applicator.

The plant population of the field was reduced approximately 15 percent by high wind on July 8. Part of the field also exhibited nitrogen deficiency symptoms due to nitrogen loss from saturated soils during the growing season. The field was harvested on October 29 using a yield mapping combine. Yield maps from the mapping combine were not available at printing. Grain yield from each strip also was measured with a weigh wagon.

Average nitrogen application rates, grain yield, and nitrogen use efficiency for the two treatments are given in Table 6 on the following page. The average nitrogen rate applied using the variable rate approach was 9.4 pounds per acre less than the fixed rate approach. Average yield for the fixed rate approach was 141 bushels per acre, 1.7 bushels per acre greater than the variable rate approach yield of 139.3 bushels per acre. The fixed rate approach required 0.99 pounds of nitrogen per bushel, while the variable rate approach required 0.93 pounds of nitrogen per bushel. None of the differences between fixed and variable rate approaches were statistically significant.

Figure 9, also on the following page, illustrates grain yield of individual strips. The downstream end of the first three strips were in a lower area of the field in which water ponded, resulting in substantial nitrogen loss, probably through denitrification, and reduced yield.

Figure 9. Strip average grain yields.

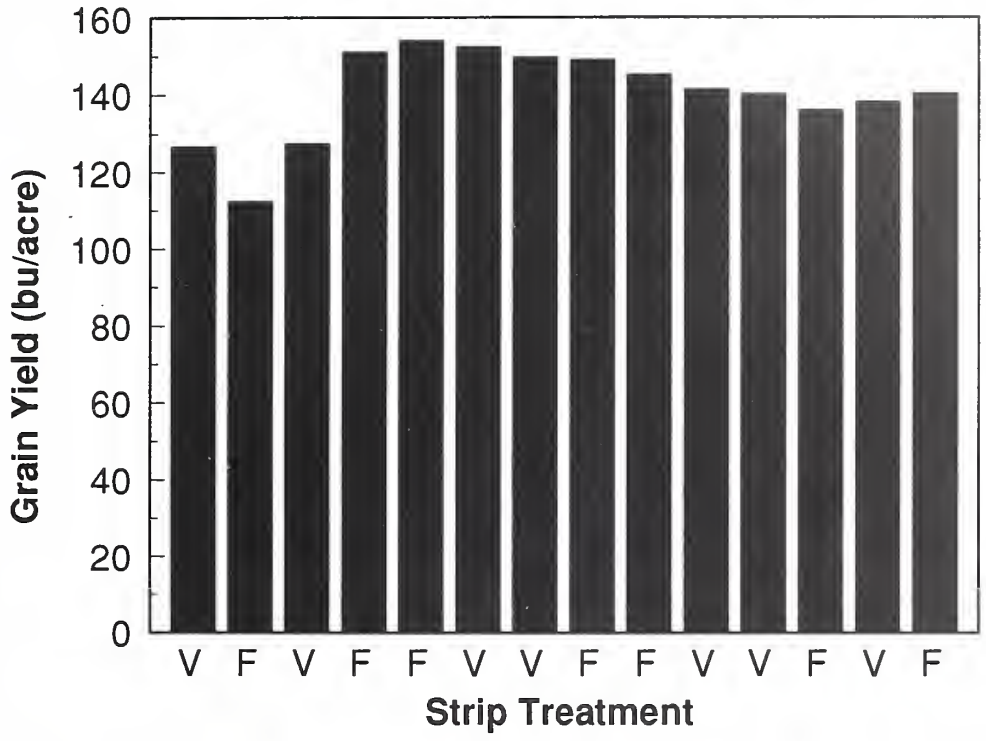


Table 6. Treatment strip mean values.

Treatment	N Applied (lb/acre)	Grain Yield (bu/acre)	Moisture (%)	N Use Efficiency (lb N/bu)
Fixed	138	141	18	0.99
Variable	128.6	139.3	18.3	0.93

Who to contact in your area for more information...

Adams County

Ken Franzen, SCS, 2727 W. 2nd, Suite 102, Hastings, NE 68901, 402/462-5412
Paul Swanson, CE, P.O. Box 30, Hastings, NE 68901, 402/461-7209
Douglas Carter, ASCS, 2727 W. 2nd, Hastings, NE 68901, 402/463-6771
Cooperators:
Bruce Bohlen, RR 1, Box 201, Glenvil, NE 68941, 402/463-6371
Larry Christensen, 604 Shoreside Rd, Hastings, NE 68901, 402/463-2951
Myles Ramsey, Rt. 1, Box 83, Kenesaw, NE 68956, 402/752-8134
William McLeod, RR 1, Box 159, Juniata, NE 68955, 402/751-2752
Milton Ruhter, RR 1, Box 188, Juniata, NE 68955, 402/751-2398

Clay County

Richard Hayes, SCS, 209 W. Fairfield, Clay Center, NE 68933, 402/762-3569
Chuck Burr, CE, Clay Center, NE 68933, 402/762-3644
David Studnicka, ASCS, 100 S. Alexander, Clay Center, NE 68933, 402/762-3521
Cooperators:
Dave Hamburger, RFD 2, Harvard, NE 68944, 402/463-8072
Steve Yost, 109 N. Clay, Clay Center, NE 68933, 402/762-3845

Fillmore County

Kent Norquest, SCS, 120 S. 12th St., Rm 2, Geneva, NE 68361, 402/759-4017
Tom Dorn, CE, 972 G. St., Geneva, NE 68361, 402/759-3712
Bryan Dohrman, ASCS, Box 426, Geneva, NE 68361, 402/759-4463
Cooperators:
Jim Bedlan, 606 Swartzendruber Drive, Shickley, NE 68436, 402/627-3745
Howard Lefler, RR 1, Box 12, Fairmont, NE 68354, 402/268-6511

Franklin County

E. Joe Vavricka, SCS, 713-15th Ave., Franklin, NE 68939, 308/425-6276
Alan Corr, CE, P.O. Box 306, Franklin, NE 68939, 308/425-6277
James Shelton, ASCS, Box 126, Franklin, NE 68939, 308/425-6234
Cooperators:
John Jelken, RR 1, Box 119, Hildreth, NE 68947-9736, 308/775-3273
Butch Ortgiesen, Rural Route, Wilcox, NE 68982, 308/478-5270

Hamilton County

Dennis Schroeder, SCS, 1611 10th St., Aurora, NE 68818, 402/694-3500
Andy Christiansen, CE, P.O. Box 308, Aurora, NE 68818, 402/694-6174
Kelly Grossnicklaus, ASCS, Box 148, Aurora, NE 68818, 402/694-3122
Cooperators:
Joel Anderson, P.O. Box 175, Polk, NE 68654, 402/765-3741
Curt Carlson, Rt 1, Box 146, Marquette, NE 68854, 402/854-3151
Carey Friesen, Rural Route, Henderson, NE 68371, 402/723-4260
Clayton Higgins, RR 1, Giltner, NE 68841, 402/849-2216
The Grain Place, Mike Herman, RR 1, Box 163, Marquette, NE 68854, 402/854-3195

Harlan County

James D. Miller, SCS, P.O. Box 320, Alma, NE 68920, 308/928-2626
Tony Anderson, CE, Box 258, Alma, NE 68920, 308/928-2119
Lee Christenson, ASCS, Box 410, Alma, NE 68920, 308/928-2172
Cooperators:
Al Hollertz, Rt 2, Box 206A, Holdrege, NE 68949, 308/567-2243

Kearney County

Buddy Steinshouer, SCS, 640 N. Minden Ave., Minden, NE 68959, 308/832-1895
Alan Corr, CE, Box 31, Minden, NE 68959, 308/832-0645 OR 308/832-2715
Richard Booker, ASCS, Box 240, Minden, NE 68959, 308/832-2280
Cooperators:
Dean Casper, RR 3, Minden, NE 68959, 308/832-1653
Dave Nielsen, Rt 2, Box 10, Minden, NE 68959, 308/832-0556

Nuckolls County

Larry Waneking, SCS, P.O. Box 307, Nelson, NE 68961, 402/225-2311
Steve Melvin, CE, Box 386, Nelson, NE 68961, 402/225-2381
Dale Kovanda, ASCS, Box 367, Nelson, NE 68961, 402/225-3401
Cooperators:
Don Kottmeyer, RR 1, Box 106, Hardy, NE 68943, 402/279-2625
Lale Oellerich, RR 2, Davenport, NE 68335, 402/364-2379

Phelps County

Buddy Steinshouer, SCS, 1308 2nd St., Holdrege, NE 68949, 308/995-6141
Gary Hall, CE, 1308 2nd St., Holdrege, NE 68949, 308/995-4222
Kevin Pesek, ASCS, Box 201, Holdrege, NE 68949, 308/995-6121
Cooperators:
Bruce Anderson, Rt 1, Box 18, Holdrege, NE 68949, 308/263-4151
Chris Erickson, Rural Route 3, Holdrege, NE 68949, 308/995-8421
Lloyd Erickson, Rural Route 3, Holdrege, NE 68949, 308/995-6286

Polk County

Kristi Schleif, SCS, P.O. Box 526, Osceola, NE 68651, 402/747-2461
Coleen Pallas, CE, Box 215, Osceola, NE 68651, 402/747-2321
Ilene Anderson, ASCS, Box 547, Osceola, NE 68651, 402/747-2111
Cooperators:
Mark Newcomer, Box 68, Stromsburg, NE 68666, 402/764-5421

Saline County

Jerry Bucy, SCS, Box 741, Wilber, NE 68465, 402/821-2031
Randy Pryor, CE, Box 978, Wilber, NE 68465, 402/821-2151
Verne Anthony, ASCS, Box 686, Wilber, NE 68465, 402/821-2251
Cooperators:
Wayne Hansen, Rural Route 1, Dorchester, NE 68343, 402/946-7341
Keith Spohn, RR 1, Box 120A, Friend, NE 68359, 402/947-8061

Seward County

Connie Tvrdy, SCS, 322 South 14th St., Seward, NE 68434, 402/643-6231
Dennis Kahl, CE, 216 South 9th St., Seward, NE 68434, 402/643-2981
Bruce Thompson, ASCS, Box 389, Seward, NE 68434, 402/643-4586
Cooperators:
Doug Cast, Rt 1, Box 810, Beaver Crossing, NE 68313, 402/532-7515
Dean Rocker, RR 2, Box 164, Seward, NE 68434, 402/643-2318

Thayer County

Brian Euse, SCS, 1210 South Ave., Hebron, NE 68370, 402/768-6228
Steve Melvin, CE, Hebron, NE 68370, 402/768-7212
Michael Bantam, ASCS, Box 8, Hebron, NE 68370, 402/768-6520
Cooperators:
Effenbeck Farms, c/o Alfred Effenbeck, RR 1, Box 21, Deshler, NE 68340, 402/236-8748
Leroy Voss, Rural Route 1, Bruning, NE 68322, 402/353-3805

Webster County

Merle L. Illian, SCS, 20 N. Webster St., Red Cloud, NE 68970, 402/746-2268
Chuck Burr, CE, 621 N. Cedar, Red Cloud, NE 68970, 402/746-3417
Robert Bohrer, ASCS, Box 487, Red Cloud, NE 68970, 402/746-2204
Cooperators:
Kevin Karr, Rt 1, Box 126, Bladen, NE 68928, 402/756-1176

York County

Bill Gilliam, SCS, 212 W. 6th St., York, NE 68467, 402/362-4906
Gary Zoubek, CE, RFD 4, Box 46, York, NE 68467, 402/362-5508
Maxine Knauss, ASCS, Box 485, York, NE 68467, 402/362-7751
Cooperators:
Brad Rathje, Route 1, Box 124A, Waco, NE 68460, 402/728-5378
Jerry Stahr, RR 2, Box 75, York, NE 68467, 402/362-2574
Brian Janzen, RR 1, Box 59, Henderson, NE 68371, 402/723-4966